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PREFACE

Agricultural Finance Review provides a forum for presentation of research and discussion of issues in agricultural finance. Publication is annual, and all articles are contributed by scholars in the field. Articles on assigned topics may occasionally be commissioned from specific authors.

Volume 43 is the first to be published at Cornell University. The previous forty-two volumes were published by the United States Department of Agriculture. *AFR* was begun in 1938 by Norman J. Wall and Fred L. Garlock, whose professional careers shaped much of agricultural finance research for many years. Since that time, professional interest in agricultural finance has continued to grow, involving larger numbers of people and a greater diversity in research topics, methods of analysis, and degree of sophistication. We are pleased to be a part of that continuing effort.

The effectiveness of this publication as a means of promoting agricultural finance research and discussion depends on its support by the profession. We have been pleased by the response in our first year. Thirteen manuscripts were submitted from which the six herein were selected for publication. We thank all those who submitted manuscripts.

We wish to express our sincere thanks to those who contributed their valuable time to review submissions for us:

Bruce L. Anderson
Timothy G. Baker
Peter Barry
Gary Benjamin
William N. Capener
Hoy Carmen
Francis Epplin
Stephen Gabriel
William Hardy
Duane Harris
Glenn Helmers
William Herr
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David Lins
Duane Neuman
George Patrick
Glenn Pederson
James Plaxico
Lindon Robison
Lee F. Schrader
Jerry Thompson
Richard Trimble
Alan Tubbs

Finally, we invite your suggestions for making improvements in *Agricultural Finance Review*. Manuscripts for the 1984 issue must be received by February 1, 1984. Manuscripts will be accepted at any time, however, and those received after February 1 will be considered for the 1985 issue.

John R. Brake, Editor
Eddy L. LaDue, Associate Editor
Loren Tauer, Associate Editor

The Impacts of Recent Changes in Personal Income and Business Profit Taxes on Investments in the Farming Sector

Dean W. Hughes and Ann Laing Adair

Abstract

The Economic Recovery Tax Act changed the U.S. tax structure to stimulate investment. Amendments to the act reversed some of these changes but preserved the original intent. The purpose of this article is to analyze the impacts of these tax laws on investments in the farming sector. Although the most obvious impact of decreasing tax rates on income and profits is to encourage investment, when the effects of these changes on government deficits and investments in other sectors are included, farmers are shown to have less incentive to invest their businesses than they would have without the tax cuts.

Key words: farm investment, farm taxes, ERTA, TEFRA, general equilibrium model, cost of capital.

Dean W. Hughes is an associate professor of agricultural economics at Texas Tech University. Ann Laing Adair is a research assistant at Texas A&M University. The research for this project was done while both authors were employed at the Federal Reserve Bank of Kansas City. The views expressed herein are solely those of the authors and do not necessarily represent the views of any of the institutions associated with the project.

Significant changes in the personal income and business tax laws were made with the passage of the Economic Recovery Tax Act of 1981 (ERTA) and the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). Several articles have dealt with the implications of these changes for individual farmers or for the output of specific commodities (Nixon and Richardson; Boehlje and Carman; Lybecker; Harl; and Durst, Rome, and Hrubovcek). None, however, has described the aggregate impact of the changes in the tax laws on farm investments or the dramatic impacts of these changes on the funding requirements of the government and subsequent feedback effects on agriculture.

The purpose of this article is to examine, within the framework of a general equilibrium model, the effects of some of the major provisions of ERTA and TEFRA on sector-level investment decisions. The first section will briefly describe the changes in the tax laws that are being considered in the rest of the paper. The linkages between agriculture and the general economy, which help to determine how farm sector investments are influenced by changes in the tax laws, are presented in the second section. Comparisons of the results of counterfactual simulation of the economy both with and without ERTA and TEFRA are made in the third section. The final section provides a brief statement of the conclusions of this work.

Tax Law Changes

The Economic Recovery Tax Act of 1981 was passed into law in order to stimulate investment and growth in the economy through a

series of tax reductions to increase investment incentives to businesses and saving incentives to consumers. Businesses benefit through reductions in individual and corporate income taxes, as well as accelerated cost recovery on capital items. Consumers benefit through lower income taxes and might gain eventual relief from inflation as higher business investment stimulates production of more goods at a lower cost. Some of the major provisions of the new tax laws that are analyzed in later sections of this article are described here.[1]

Farmers benefit under ERTA from reductions in personal income tax rates because the majority of farms are still sole proprietorships or partnerships. The cumulative annual impacts of these changes are reductions in personal tax rates of 1.25 percent in 1981, 10 percent in 1982, 19 percent in 1983, and 23 percent in 1984.

Possibly the most significant changes in the tax laws affecting farms as businesses relate to deductions for capital expenditures. The old depreciation system has been replaced with the Accelerated Cost Recovery System (ACRS), which eliminates the need to determine a useful life, depreciation method, and salvage value of an asset. The ACRS method is based on four classes of recovery property, 3-year, 5-year, 10-year property, and 15-year real property. Although the recovery periods for some assets remain unchanged, most items have a substantially shorter recovery period under the ACRS, thereby allowing a faster tax write-off and full depreciation of property by the end of its taxable service life. Most agricultural equipment and single-purpose agricultural structures will have a 5-year recovery period rather than their previous 10-year and 25-year useful lives.[2]

On August 20, 1982, the tax laws were changed again when the ERTA was amended by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). This act left the 1981 reductions in personal income tax rates unchanged, although it offset some of the declines in income tax liabilities by imposing withholding on interest and dividend income, increasing interest rates on unpaid taxes, and generating increased Treasury revenue in other ways (Harl). The 1982 act also left the accelerated cost recovery system unchanged until 1985.

Investment in Agriculture and Fiscal Policy

This section briefly reviews the main features of the specifications of the capital asset demand equations used in later analysis and identifies the important factors that lead producers to expand or contract the use of capital assets in farm production. A discussion of how recent changes in the tax laws affect these factors is also included.

There are many ways to explain investment behavior, but perhaps the most straightforward is the classical approach described by Lamm or by Hughes and Weimer. Traditional production economics suggests that net investment is undertaken whenever the existing level of capital assets is less than optimal—the level required to equate the marginal value product of capital to its marginal factor cost.

The driving forces behind investment are, therefore, the determinants of the marginal value product and marginal factor cost of capital. Four factors determine the marginal value product of capital: the amount of capital used, the price of output, the desired quantity of output, and the amounts of other inputs used in production. Marginal value product declines if more capital is used, holding all else constant. Thus if the marginal value product exceeds the marginal factor cost, producers move toward equilibrium by increasing the capital stock. Shifts occur in the demand for capital, if any of the other factors change. With an increase in the price or the desired level of output, the marginal value product of capital rises and more capital is demanded at any marginal factor cost. The influence of changes in the levels of other inputs is not determinant and

[1]For a more complete listing and interpretation of ERTA's provisions relating to agriculture see Durst, Rome, and Hrubovcek.

[2]ERTA also provided substantial incentives to increase lease financing. Many of the incentives were reduced or eliminated with the passage of TEFRA, and insufficient data exist to track the impacts of leasing on the farm sector (Adair, Penson, and Duncan). Thus although leasing is potentially important, it is not included in this analysis.

varies depending on whether or not the other inputs are complements or substitutes for capital.

Defining the marginal factor cost of capital (C) is still a subject of debate but is generally considered to include the price of a unit of capital, the level of interest rates, the level of tax rates applicable to purchasing or using capital, the time pattern for depreciating the capital for tax purposes, and the time pattern of physical deterioration of the services the capital asset provides.[2] C increases if the price of capital, interest rates, income tax rates, or rates of physical deterioration rise. C declines if the investment tax credit rate increases or the asset is allowed to be depreciated more quickly for tax purposes.

An analysis of how the recent changes in the tax laws will affect investment in the farming sector should, therefore, consider the influence of fiscal policy on the price and quantity of farm output, the price of capital, and the level of interest rates, as well as the direct influence of lowering tax rates.

The most obvious effect of the tax cuts on investment in agriculture is to reduce the marginal factor cost of capital directly. The full impact of the tax-induced investment stimulus will not be realized, however. All other businesses face the same stimulus and try to expand. To do so, they need to borrow, and interest rates rise, offsetting to some extent the tax-induced decline in the marginal factor cost. Given any substitutability in manufacturing machinery for farm and nonfarm use, additional investment demand in the nonfarm sectors will also increase the price of farm equipment to some extent.

Less direct but perhaps more important are the impacts the tax cuts will have on the general economy by increasing government deficits. Some projections of the 1984 deficit are greater than $200 billion (U.S. Office of Management and Budget) and equal more than half of private savings. The political process has and will probably continue to generate compromises to reduce government expenditures and increase taxes. The deficit, however, will probably continue to be large, although perhaps less than some forecasters project.

Compromises that include reductions in government spending will have both direct and indirect effects on agriculture. Agricultural policy prescriptions that continue to minimize budget exposure such as the current Payment in Kind program can be expected. Thus over time government support of farm incomes may diminish. Slower growth in domestic incomes because of reduced government spending would also have an effect on farmers. Although this effect is less direct, its magnitude is potentially greater than the effects of the more visible farm program decisions, given the growing dependence of agriculture on general economic conditions.

Large government deficits will probably keep real interest rates high.[4] Since the government deficit must be financed with either bonds or money, continuing deficits with controlled growth in the money supply imply greater government borrowing and increased real interest rates. Any stimulus to investment that might be expected from cutting tax rates will, therefore, likely be offset to some extent by higher real interest rates.[5]

Income also plays an important role in farmers' investment decisions, and increased government borrowing will likely reduce farm income. Higher real interest rates increase the costs of production and lower

[2]See Branson; Coen; Penson, Romain, and Hughes; and Jerimias for different developments of the marginal factor cost of capital. Jerimias's derivation is recommended because it is the most complete specification of the factors included in the investment decision.

[4]Deficits almost always increase interest rates above what they would be with a balanced budget. During recessions, however, part of the deficit is an automatic response to lower economic activity, and declines in private demands for funds can offset the growing demands by the government. Thus the full employment deficit is a more appropriate measure of the likely impacts of fiscal policy on interest rates. The full employment budget is projected to be in deficit by as much as $90 billion in 1984.

[5]These effects of higher real interest rates are not unique to farming, and they point out the distributional consequences of different macroeconomic policies in achieving similar goals. Clearly, investments are skewed away from all interest sensitive sectors such as construction and automobile manufacturing in periods of high real interest rates.

prices received by farmers over the short-to-intermediate term.[6] With farm debt at about $200 billion, a one percentage point increase in interest rates adds about $2 billion to production expenses. On the receipts side, farm-level prices are also sensitive to changes in real interest rates (Schuh; Scherr and Madsen). Since most purchasers of farm products must hold them as inventories, higher interest rates tend to depress the prices offered to farmers. High real interest rates also slow general economic activity and increase the foreign exchange value of the dollar, further reducing both the demand for farm products and prices received by farmers. Both simulation results using the GEM model and reduced form estimates of farm price equations show the elasticity of constant dollar farm prices to changes in real interest rates to be about 0.15.[7] Given 1982 levels of interest rates, farm prices, and incomes this translates into a decline in farm revenues of about $2 billion for each one percentage point increase in interest rates.[8]

[6]Over the very long run, reductions in farm output in reaction to higher costs would eventually cause returns on farm assets to increase in order to be competitive with other investments. In the short-to-intermediate term, however, farmers will continue to produce as long as they cover variable costs and are making some contribution to fixed costs. The long-run adjustment occurs when lenders are unsatisfied with the partial payment to debt and they force exits from the sector. Even then, only marginal farmland leaves production. Thus quantity adjustments in agricultural production take many years and are probably of little importance in a world of substantial swings in short-run policies.

[7]Both the GEM model (Hughes and Penson 1980) and reduced form estimates of quarterly prices received generate substantially the same result. The GEM model was run with real interest rates increased by 10 percent above their simulated values for 1982, approximately one percentage point. The result was a decline in prices received by about 1.5 percent. The reduced form equations regressed prices received for livestock and crops as functions of real interest rates and other variables. Elasticities calculated from the reduced form equations confirmed the results of the model runs.

[8]Given an elasticity of prices received to real interest rates [(dP/dr)(r/P)] of .15, an index of constant dollar farm prices of about 1.0, and real interest rates about 0.10, the change in farm prices for one unit change in the real interest rate is 1.5. If the interest rate increases by one percentage point, the prices received index declines by .015. Assuming there is no short-run quantity adjustment, the impact of a one percentage point increase in interest rates is to decrease farm revenues by 1.5 percent. With farm revenues about $140 billion, this works out to be about a $2 billion decline in farm income for each percentage point increase in real interest rates.

Timing and Size of Probable Impacts

Several countervailing forces that have an impact on farm sector investment emanate from the recent changes in the tax laws. The direct effect of reducing tax rates on income and capital is to lower the marginal cost of capital and stimulate investment. Offsetting the direct effects of the tax cuts are increases in the prices of capital assets and the impacts of higher interest rates on the marginal cost of capital and farm income.

The reaction of agriculture to changes in the tax laws is, therefore, an empirical question. At the very least, the magnitude of the influences of each of the linkages outlined above is needed to address the question posed in this research. This section describes the econometric model used to stimulate the economy over the 1982-84 period, both with and without the tax cuts. It also includes a discussion of the assumptions underlying the two scenarios and the results of running such an experiment.

The Model

The model used in this research is the GEM model developed by the U.S. Department of Agriculture (USDA) (Hughes and Penson 1980) and has been used by the USDA and others for both forecasting and evaluating financial implications of macroeconomic policies (Hughes 1979, 1981a, 1981b; Hughes, Gabriel, et al.; Duncan, Hughes, and McDonley; Hughes and Penson 1981). GEM, an acronym for general equilibrium model, incorporates equations covering all the goods in the economy. GEM is a macroeconomic model but differs from most other models of the economy in two important aspects: (1) it focuses on agriculture, providing detailed reports of the major financial accounts of the sector, and (2) it accounts for the flows of both goods and services—the principal building blocks of other macroeconomic models—and the stocks of wealth of each endogenous sector.

The model factors the economy into six sectors: farm operator families, other domestic consumers, nonfarm producers, financial intermediaries, the government, and the rest of the world. Farm operator families is the sector with the most detail. It has two explicit production functions, one for crops and

one for livestock. Both the demands for inputs and the supplies of outputs are determined simultaneously. In addition, farm operator families' economic decisions are handled in a way that recognizes that they are both producers and consumers. Thus the model captures trade-offs within the farm sector among consumption, investment, and saving.

In the GEM model, particular attention is given to developing capital input demand equations. Costs of capital are used to account for many of the recent changes in the tax laws. These costs are also linked to real interest rates, farm income, and prices of nonagricultural durable inputs also solved for in the model.

Assumptions Made in Comparing Investment with and without Tax Cuts

As with all econometric models, GEM requires projections of exogenous information to simulate endogenous variables, and as with most counterfactual analyses, a baseline or "most likely" run of the model underlies the comparisons. Without dealing with the specific levels of each of GEM's 60 exogenous variables, it is possible to describe the basic premises of the baseline.

Assumed fiscal policy incorporates the personal and business tax rate reductions passed as part of the Economic Recovery Tax Act of 1981. Personal tax rates for farm operator families and other domestic consumers are decreased by 10 percent in 1982, 19 percent in 1983, and 23 percent in 1984. Business taxes are reduced $3.6 billion in 1982, $6.0 billion in 1983, and $9.5 billion in 1984 to reflect the accelerated cost recovery provisions of the 1981 act (Condrell). Tax depreciation rates used in calculating costs of capital are also adjusted to account for the service lives allowed under the new law. Some slowing of the rate of increase in government expenditures is assumed. Although deficits increase, they do not grow to more than $200 billion but are only $130 billion in 1984. Consistent with slower growth in government expenditures, continued reductions of government support of agriculture are built into the baseline. Included are constant real dollar target prices and continued reductions in purchases of food for school lunch programs, food stamps, and aid to the elderly through 1984.

Monetary policy is assumed to continue to constrain growth in monetary aggregates, which results in a rapid decline in inflation. Growth in foreign economies is assumed to be slower than in the recent past, increasing only 3 percent per year compared with over 4 percent annually during the 1970s. Finally, no supply shocks are anticipated. Neither unusual weather patterns generating agricultural shocks nor large increases or decreases in the price of imported fuel are assumed.

Aggregate Baseline Results

The baseline assumptions generate projections of slow economic growth.[9] The average annual growth in real gross national product is 2.8 percent for 1982 through 1984. Real interest rates remain high, with the average real rate on Treasury bills at 6.6 percent through the period. Nominal rates, however, are projected to come down as a result of disinflation. Inflation, as measured by the GNP deflator, declines to 5.6 percent in 1984 after peaking at 9.1 percent in 1981.

In the baseline, net farm income is projected to be very low in 1982 but to start to grow in 1983 and to be reasonably high in 1984.[10] The relatively low net farm incomes coupled with extremely high real interest rates generate projections of farm investment in machinery and motor vehicles and real estate improvements for 1982 through 1984 that are lower than in the preceding three years in both current and constant dollars. No large increases in agricultural investment are, therefore, projected even with the implementation of the tax cuts.

This is not the answer to the question posed in this research, however. Projections of slower investment in the farm sector in 1980–84 could have any number of causes. Another model run is required, differing only in the assumptions regarding the exogenous variables directly affected by the tax law changes. Comparisons of the results of the two model runs then identify changes in farm sector investment caused by changes in the tax laws.

[9]For a more complete listing see the baseline results reported in Duncan, Hughes, and McDonley.

[10]In constant dollars, the projected net farm income for 1984 is still $2 billion lower than net farm income in 1979.

Table 1. Impacts of 1981 and 1982 Tax Law Changes on Selected Macroeconomic and Farm Sector Variables

Variable	Percent Change between Model Results with and without Tax Law Changes [a]		
	1982	1983	1984
Real GNP	−0.8	0.5	1.1
Real Treasury bill interest rate	7.0	34.8	49.7[b]
Prices of machinery and motor vehicles	0.1	1.1	1.9
Cost of capital	1.1	7.7	14.8
Prices received for crops	−1.6	−2.0	−0.7
Prices received for livestock	−0.4	0.0	2.5
Gross farm receipts	−1.0	−1.0	0.8
Farm production expenses	1.6	2.1	3.6
Net farm income	−21.9	−17.1	−10.9
Capital stock of machinery and motor vehicles			
Value	0.1	1.0	1.4
Capacity	0.0	−0.2	−0.5
Gross investment in machinery and motor vehicles			
Value	0.3	−0.3	1.0
Quantity	0.2	−1.4	−0.9

[a]Results reported in percentages and developed by dividing outcomes assuming tax cuts by outcomes assuming no tax cuts. All variables are in constant dollars.

[b]Percentage changes on low base numbers can be deceiving. The 49.7 percent change represents a difference between the results of less than two percentage points.

Removing the tax cuts changes some exogenous variables. Government deficits decline to only $25 billion in 1984, which allows the assumed monetary policy to be less restrictive and still achieve the same level of inflation in 1984 as in the baseline.[11]

The Impact of the Tax Cuts on Agricultural Investment

Table 1 shows the results of comparing the two model runs for selected macroeconomic and farm sector variables for 1982 through 1984. Effects of changes in the tax law on farm investment in machinery and motor vehicles are emphasized, because these investments account for more than half of total farm investment. Each of the determinants of investment discussed in previous sections is listed.

As might be expected, real interest rates are projected to be substantially higher given the tax cuts. Slower growth in real gross national product might be expected with higher interest rates but does not occur in all years. The tax cuts reduce growth in 1982, but growth is greater with the tax cuts in 1983 and 1984. Basically, the stimulus given the economy in 1982 by tax reductions is not large enough to overcome the drag of high real interest rates. By 1983, the cumulative stimulus of the tax cuts overrides the impact of higher interest rates, and gross national product grows faster with implementation of the ERTA and TEFRA.

Prices received by farmers show mixed results. The higher interest rates in the tax cut scenario generate lower farm prices in 1982. In 1983 and 1984, however, prices received for livestock in the tax cut scenario surpass those in the no tax cut scenario, and prices received for crops continue to lag behind. This difference in behavior occurs because livestock prices are more sensitive than crop prices to the rate of economic growth in the model. Since GNP grows faster in the tax cut scenario, livestock prices eventually overcome the negative influence of higher interest rates and

[11]A "less restrictive" monetary policy in the GEM model is somewhat different from the commonly accepted definition. The GEM model excludes the money market rather than the bond market by using Walras's Law and the government budget constraint. Thus monetary policy is measured by growth in the stock of government bonds held by the public, not the growth in the money supply. Given a lower government deficit, a constant growth in the money supply implies slower growth in government bonds—a "less restrictive monetary policy."

surpass prices in the no tax cut scenario. With the tax rate cuts and higher real interest rates, gross farm receipts are lower in 1982 and 1983 than if the tax laws had not been changed. Even though gross farm receipts increase in 1984, the increase is insufficient to overcome increases in production expenditures in all three years. Net farm income, therefore, is lower in all three years, given the tax cuts.

The tax stimulus to investment in all sectors increases the price of capital inputs to the farm sector. This effect, coupled with higher interest rates, overwhelms the impact of lower taxes, producing a higher cost of capital. With a higher cost of capital and lower incomes, the optimal capital stock in farming declines. The result is a smaller quantity of net investment. While higher prices for capital inputs increase the value of gross investment and the value of the capital stock, the quantity of machinery and motor vehicles in farming decreases with the 1981 and 1982 tax cuts.

Summary and Conclusions

The Economic Recovery Tax Act of 1981 and subsequent amendments posted in the Tax Equity and Fiscal Responsibility Act of 1982 have changed many of the economic incentives of farmers, other businesses, and consumers. Farmers and other consumers that pay income taxes will have lower tax rates every year until 1984. Businesses can recover their cost of investment more rapidly and therefore have a greater incentive to purchase capital inputs.

Analyzed separately, these changes in the tax laws should provide farmers with reasons to increase their capital stock. Such a partial analysis can be misleading, however. When all the effects of changes in the tax laws are traced through the government deficit and actions of other sectors, instead of being encouraged to increase investment, farmers may have the incentive to reduce investment.

The tax law changes will increase the incentive for all businesses to invest, which in turn will probably lead to increases in both the price of durable inputs and interest rates. These changes in the tax laws are also generating large government deficits that increase interest rates even further. Given the interest rate sensitivity of net farm income and the effects of higher interest rates and higher prices of durable inputs on the cost of capital, lower tax rates introduced in ERTA may reduce the optimal agricultural capital stock below what might have existed with the old tax laws. Actual quantities of capital follow the optimal level downward, even though the value of the capital stock may be held high by price increases. Thus the farming sector may be one of many sectors that show a perverse reaction to the policy of using general tax reductions to encourage investment.

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Evaluation of State Legislative Programs to Assist Beginning Farmers

James Lowenberg-DeBoer and Michael Boehlje

Abstract

Since the mid-1970s interest has grown in state programs to aid beginning farmers. State legislation is characterized by three approaches: direct loan programs based on tax-exempt bonds, loan guarantee programs, and tax incentives for landowners who sell or lease their land to beginning farmers. Most state programs focus on subsidizing real estate purchases. The public cost of the approaches differs substantially. The bond-based direct loan approach is the highest cost method now used in the United States. Relatively low-cost options include tax incentives for landowners who lease land to beginning farmers and matching grants for savings toward a farm purchase by prospective farmers.

Key words: Beginning farmers, loan guarantees, tax incentives, tax expenditures, land banking.

Between 1976 and 1981 many state legislatures debated and implemented programs to aid beginning farmers by subsidizing credit or giving tax incentives to landowners to sell or lease their land to young farmers. State interest in programs for beginning farmers was a response to a public perception that starting a family farm was becoming increasingly difficult and that federal programs such as those of the Farmers Home Administration were not doing enough to aid entry. Although research has identified a wide range of problems faced by beginning farmers, including risk and rising managerial requirements (Boehlje and Thomas, pp. 21–23), most of the legislative activity and public debate on programs to aid young farmers has centered on helping entrants gain control of the physical resources necessary to begin farming (U.S. House of Representatives, "Beginning Farmer Assistance Act Hearings," and U.S. Senate, "Hearings on the Young Farmers Homestead Act"). This article describes state programs for beginning farmers as they existed in 1982 and evaluates the cost-effectiveness of state options for reducing resource control barriers to entry.

Barriers to Entry

Compared to many other American industries, agriculture has few barriers to entry. There are no licensing requirements, and capital levels are relatively modest. Unlike people who seek careers in most other industries, however, farmers are expected to provide both their labor and a substantial amount of capital. As labor became a smaller portion of the total farm inputs and

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capital a larger portion, it became clear that the low-net-worth entrant was at an increasing disadvantage and the family farm system, in which a person provides both labor and capital for the farm business, was threatened. Public debate has focused on the barrier resulting from the high cost of farm real estate (U.S. House of Representatives, "Beginning Farmer Assistance Act Hearings," and U.S. Senate, "Hearing on the Young Farmers Homestead Act").

Recent studies of barriers to entry have confirmed the importance of managerial ability, risk-bearing capacity, and control of physical resources, and some studies have questioned whether increasing capital requirements are the primary barrier to entry. In a study of the opportunities for young farmers in southern Minnesota, Thomas and Jensen found that the prospects for superior managers were bright, but the average manager was likely to face a future of low income and financial difficulty. From an analysis of census data in the mid-1970s, LaDue (a) found that the chances of a prospective farmer finding the resources needed to enter had declined. Kaiser's study of financial strategies used by beginning farmers suggests that risk is an important factor in limiting entry options.

Although the increased use of capital is obvious to anyone familiar with U.S. agriculture, the importance of that increase for beginning farmers is less clear. Entry-level capital requirements may not have grown as much as average capital use. In a study of young PCA borrowers, Herr and Obrecht found entry-level capital is often far less than the average capital per farm. In a study of conditions faced by entering farmers between 1945 and 1977, LaDue (a) found that although capital accumulation before entry was difficult throughout the period, liberalization of credit terms had tended to offset the increase in capital requirements. Lowenberg-DeBoer analyzed data from young farmers' records in 1910, 1930, 1950, and 1978 and found that those who started as tenants may have had more trouble gaining control of capital, but for those who started as owner-operators the hypothesis of increasing difficulty over time was not supported. Both LaDue and Lowenberg-DeBoer found that repayment capacity after entry had not deteriorated over time.

State Legislation

State programs with direct implications for entry into farming have been legislated in Minnesota, Louisiana, Texas, North Dakota, Iowa, Georgia, and Indiana. These programs differ in their commitments to beginning farmers. Legislation in Iowa, Minnesota, Texas, and North Dakota is narrowly focused on beginning farmers, whereas that in Louisiana, Georgia, and Indiana includes a broader eligibility group. Programs in these seven states should be distinguished from two other groups of state agricultural credit programs: (1) the general farm credit programs that have been legislated in Alabama, Nebraska, Arkansas, Tennessee, Virginia, South Carolina, and Colorado, and are funded through revenue bonds, and (2) the older farm credit programs funded from income from rental and mineral royalties on state lands, such as the Wyoming Farm Loan Board and the farm loan program of the Oklahoma Commissioners of Land Office. The programs in both of these latter groups may benefit beginning farmers, but the legislation on which they are based does not explicitly mention such an aim, nor do the eligibility standards indicate concentration on those entering farming.

Minnesota: The oldest of the state programs for beginning farmers is the Minnesota Family Farm Security Program enacted in 1976 (*Minnesota Statutes Annotated*). The program guarantees real estate loans, subsidizes interest payments, and exempts interest on seller-sponsored loans from state income taxes. The guarantee indemnifies the lender for 90 percent of the loss of principal and interest in case of a default. The guarantee is backed by a $10 million fund, which according to program officials can secure $100 million in loans. As of the end of 1981, some 318 loans with a total value of $56 million had been guaranteed. The interest subsidy is accomplished through an interest payment adjustment of 4 percent, which is available if the maturity date of the loan is within 20 years. If, for example, the interest rate is 12 percent, the effective rate for the applicant becomes 8 percent with the balance being paid out of the state treasury. The payment adjustment must be repaid without interest in a balloon payment at the end of the repayment period, so the actual subsidy is the interest-free use of

state money during the adjustment period. The payment adjustment can be seen as a variation on graduated payment plans, which allow lower loan repayments during the early years of a farmer's career.[1]

Louisiana: The mechanism of the Louisiana Family Farm Loan Program (*Louisiana Revised Statutes*) is similar to that of the Minnesota program. The 1980 Louisiana program includes 90 percent guarantees on commercial and seller-sponsored loans and an adjustment of one-half of the interest payment. No tax incentive provisions are included. The guarantee is not backed by a guarantee fund. When defaults occur, the Family Farm Council, which controls the program, must request funds from the legislature to pay the lender. The State Marketing Commission has successfully operated a program for agriculture-related businesses with a similar guarantee arrangement for more than 40 years. The first applications for guarantees were accepted in the spring of 1982.[2]

Texas: Another variation on the Minnesota loan guarantee and payment adjustment program was enacted in Texas in 1979 (Texas, *Vernon's Annotated Revised Civil Statutes of the State of Texas*). The program includes 90 percent guarantees and a 4 percent interest payment adjustment. The program was to have been funded by selling tax-exempt revenue bonds, but Internal Revenue Service regulations prevented doing so.[3] Because of the lack of funding, the program has been suspended until September 1983.

North Dakota: North Dakota has a many-faceted group of programs for beginning farmers: the 1978 joint FmHA and Bank of North Dakota lending agreement to provide 100 percent financing; a 1979 tax incentive program to encourage landlords to sell or lease their land to beginning farmers (*North Dakota Century Code*, 57–38–67 to 57–38–70); a Minnesota-style guarantee program for seller-sponsored loans passed in 1981 (*North Dakota Century Code*, 54–17–29 to 54–17–31); and the 1981 North Dakota Agricultural Development Act (*North Dakota Century Code*, 4–36–01 to 4–36–27), which empowers the Industrial Commission to use tax-exempt bonds for farm credit. The 100 percent financing program is made possible by the unique institution of the Bank of North Dakota, which is the only state-owned bank in the United States. In many ways the joint FmHA and Bank of North Dakota program is more like the joint FmHA and Federal Land Bank loan program than like the loan programs in other states. Between July 1, 1978, and September 14, 1982, the program was involved in 395 loans with a total value of $25,999,275.

Tax incentives play a major role in the North Dakota program. A landowner who enters into a lease of three years or more on 20 acres or more of farmland with a qualified beginning farmer can exempt from state income taxes all of the rental income up to $25,000. A landowner who sells 20 acres or more to a beginning farmer can exempt from state income taxes for the year of the sale all the taxable capital gain. A landowner who enters into a contract for deed on 80 acres or more with a qualified beginning farmer can exempt all the interest income from state income taxes if the contract has a term of more than 15 years and the interest rate is not more than the IRS minimum. In 1980, 456 taxpayers claimed deductions of $2,656,331 under these provisions.

Iowa: The original Iowa Family Farm Development Act of 1980 (*Code of Iowa*, Chapter 175) created the Iowa Family Farm Development Authority (IFFDA) to issue public offerings of tax-exempt bonds and use the proceeds to finance real estate and non-real estate purchases by beginning farmers. The lack of an FmHA guarantee and IRS regulations on the grouping of tax-exempt bond issues prevented the implementation of the original program. A 1981 amendment to the Act, however, empowered the IFFDA to issue

[1]More details on the eligibility standards of the programs are available in Lowenberg-DeBoer and Boehlje.

[2]As of June 1983 the Louisiana program is dormant. No guarantees have been made. Problems with the program included lack of funding for the payment adjustment.

[3]For a more detailed description of the problems Texas and other states have had with IRS bond regulations, see Lowenberg-DeBoer and Boehlje, pp. 10–11, 14.

bonds for individual beginning farmers. A separate tax-exempt bond is issued for each loan and placed privately with the local lender who makes and services the loan. Private placement of the bonds reduces or eliminates printing, marketing, and legal expenses. In 1982, 197 loans with a total value of $12.6 million were made under the program.

Georgia: In 1980 the Georgia legislature amended the Georgia Residential Finance Authority Act to empower the authority to issue tax-exempt bonds for farm financing (*Code of Georgia,* Chapter 99). The program was never implemented because of problems with obtaining FmHA guarantees. The legislation authorizes loans for real estate, equipment, and farm improvements.

Indiana: Legislation creating the Indiana Agricultural Development Authority was passed in 1981 (*Indiana Statutes*). Lending under the program is to be for both real estate and non-real estate purchases and will operate through local lenders. Implementation of the program has been delayed by the lack of FmHA guarantees and IRS regulations on tax exempt bond issues.

Evaluation of State Programs

A major question in the analysis of programs for beginning farmers is which approach is most cost-effective.[4] Ideally, the cost-effectiveness would be measured by empirical data on state expenditures and program success. Unfortunately, such data are not available; the programs are very young and their success is difficult to measure. Even if data were available it might be difficult to compare cost-effectiveness between states because of their vastly different production techniques, products, and environments. But budgets using the provisions of existing programs can help focus the analysis. If budgeted costs under identical conditions vary widely, the question is narrowed to one of comparative effectiveness. For example, it may not be possible to compare the effectiveness of policies for beginning farmers directly, but if it is known that one approach is 10 times more expensive than another, it may be possible to assess whether the more expensive approach is 10 times more effective.

All of the existing state programs for beginning farmers deal with the problem of resource control. The policy options for state legislatures that wish to reduce problems faced by beginning farmers in real estate control are (1) direct loans for real estate purchase with loan funds raised through tax-exempt revenue bonds; (2) guarantees on real estate loans from private sources; (3) tax incentives to encourage landowners to sell their land to young farmers; (4) tax breaks for landowners who lease their land to beginning farmers; (5) state purchase and lease of farmland to beginning farmers; and (6) subsidizing the savings of beginning farmers through matching grants. Options 1 through 4 are now being used by several states. Options 4 and 5 are in use in foreign programs for beginning farmers that are designed to deal with entry problems similar to those encountered in the United States. A provincial program that purchases farmland and leases it to beginning farmers has operated for the past decade in Saskatchewan (*Statutes of Saskatchewan,* Chap. 60, 1972). A program that offers matching grants on savings to be used in the purchase of farm real estate operates in New Zealand (*Statutes of New Zealand,* No. 45, 1974). Options for helping entrants meet their needs for non-real estate capital are similar to the direct loan, guarantee, and savings subsidy programs for real estate. Programs involving leasing of non-real estate resources are not readily available because of the undeveloped state of equipment, livestock, and facility leasing in agriculture and will not be considered in this discussion.

Real Estate Control

The approaches for helping beginning farmers control real estate differ substantially in their cost. Table 1 gives estimates of the cost to the public sector per dollar of real estate capital provided to a beginning farmer. The estimates were developed for conditions in Iowa in 1981, using an average real estate capital investment of $520,598 (USDA, *Eco-*

[4]Other questions which analysis of these programs should answer are whether the state governments are the right authority for handling beginning farmers' problems, and whether the implementation of the existing beginning farmer programs fits the goal of reducing barriers to entry. These questions are dealt with by Lowenberg-DeBoer and Boehlje.

Table 1. Real Estate Control Program Costs per Dollar Invested[a] per Farmer under Iowa Conditions in 1981

	Direct Loan	Guarantee and Payment Adjustment	Farmland Leases and Purchase	Savings Subsidy	Tax Incentive for Sale	Tax Incentive for Lease
State cash costs in year:			(in nominal dollars)			
1	0	0.1337	0.1345	0.0500	0.0126	0.0035
2	0	0.0330	0.0795	0	0.0124	0.0035
3	0	0.0323	0.0795	0	0.0123	0.0035
4	0	0.0315	0.0795	0	0.0121	0
5[b]	0	0.0306	0.0795	0	0.0119	0
Federal cost in year:						
1	0.0460	0	0.0505	0	0	0
2	0.0451	0	0.0505	0	0	0
3	0.0441	0	0.0505	0	0	0
4	0.0431	0	0.0505	0	0	0
5[b]	0.0419	0	0.0505	0	0	0
Present value of all government cost[c]	0.3248	0.1227	0.5537	0.0500	0.0982	0.0089

[a]The cost per dollar of capital that the beginning farmer is to control, assuming that administrative cost is linear.

[b]The costs of the direct loan, guarantee, and tax incentive programs continue to the twentieth year.

[c]Present value of the cost to both state and federal governments per dollar invested for the life of the program.

nomic Indicators of the Farm Sector, p. 154). This investment represents about 268 acres at the 1981 average price of $1,941 per acre (USDA, *Farm Real Estate Market Developments*, p. 14). The cost estimates do not presume, however, that a beginning farmer must start with an average size farm. Except for a small administrative charge in some programs, the cost of the programs is a constant function of the capital requirement. Hence multiplying the cost per dollar of capital by the beginning capital amount allows estimates to be made for cases in which farmers start on smaller than average farms, or in which program participants provide part of their beginning capital. Economies of size in the financial markets are not considered in these estimates. Actual costs may differ because of loan size, volume, and other factors. All cost estimates assume that, if a subsidy to sellers is involved, revenue bond buyers and landowners are in upper income brackets; hence the uppermost marginal tax bracket is used, 50 percent for federal taxes and 13 percent for state taxes. None of the cost estimates include losses resulting from default. All of the estimates assume an operating program; original development costs are not considered.[5]

The direct loan program costs assume a 20-year 100 percent loan with a program participation fee paid by the farmer to cover administrative costs. Funds for the program are raised by the public or private sale of bonds. For simplicity it is assumed that the interest rate at which farm payments are amortized is the same as that paid on the bonds, as would be the case with private sale of bonds. The interest rate used is 9.19 percent, the rate on Aa municipal bonds in January 1981 (Moody's Investor Services, p. a10). This rate is also used for the calculations of present value. It is assumed that the bonds are paid off as the loan is repaid. The cost of the program to the federal government is the tax revenue lost. Iowa tax rules do not offer an exemption for revenue bond interest, so no tax revenue is lost by the state.

[5]More details on how the estimates were derived are available in Lowenberg-DeBoer and Boehlje (1983).

This analysis of the cost of a direct loan program uses the tax expenditure approach. That is, tax exemptions are considered public expenditures just as are grants and subsidies (Surrey, p. 6–7, 35–40). If the public budget is seen as a process that must eventually balance, tax exemptions must be offset by higher taxes elsewhere or unmet needs in other programs. In modern economies the balancing may occur through inflation-induced tax bracket creep or cuts in effective program budgets instead of direct tax increases or program cuts, but the effect of tax exemptions is felt nonetheless. The tax expenditure approach is also used in the analysis of the tax incentive for sale and lease of farm real estate programs. Based on the tax expenditure approach to determining costs, the direct loan program would result in a present value of total cost of 32.48 cents per dollar invested. This cost is borne totally by all U.S. taxpayers through reduced tax revenues.

The guarantee and payment adjustment program estimate is based on a program such as Minnesota's. It is assumed that one dollar in the guarantee fund can be used to guarantee $10 in loans. An administrative cost of $352 per participant is based on the cost of the Minnesota program (Minnesota Department of Agriculture). The tax exemption for interest is not included in this estimate because tax exemption is considered as a separate approach. The payment adjustment is 4 percent. The payment adjustment period is assumed to be 10 years with repayment in the eleventh year. The guarantee fund is assumed to revert back to the state in the twentieth year. Calculations use a 20-year, 100 percent loan amortized at the Federal Land Bank interest rate for the first quarter of 1981—10.6 percent (Melichar and Balides, p. 32). It is assumed that the guarantee fund is a "safe" investment at 7 percent interest. In reality the guarantee fund might be invested in other municipal bonds, so that the interest rate on the fund could match the interest rate used for analysis of present values. But it seems likely that there is some opportunity cost in maintaining the fund, so a 7 percent return is used. Cost to the state in the first year of the program would include creation of the guarantee fund, administrative cost, and the payment adjustment. It is assumed that the guarantee fund is created at the beginning of the first year and that other payments are made at the end of the year. In the twentieth year, the guarantee fund is returned to the state. The present value of total cost over the years is 12.27 cents per dollar invested. The cost of this program is borne completely by taxpayers in the state. The guarantee program without the payment adjustment would have a present value of cost of 2.58 cents per dollar. The present value of the cost of a payment adjustment program without a guarantee is estimated at 10.30 cents per dollar.

The estimates for the land purchase and lease option were developed using the provisions of the Saskatchewan Land Bank program. The calculations assume that the funds for the land purchase are raised by public sale of bonds as provided under the Land Bank Act. Under U.S. conditions these bonds would be tax-exempt. It is assumed that the purchase and lease authority would be similar to the Iowa Housing Authority and would have its bond issues rated Aa. On the basis of Carr and Smith's argument that land bank programs inevitably pay more than market price for land, 10 percent was added to the real estate price. The lease rate was set at $101.80, the 1981 market rate for average Iowa farmland (USDA, *Farm Real Estate Market Developments*, p. 19). Other costs are a management fee of 7 percent of the gross rent ("An Inside Look at Farm Management Fees," p. 21), a first-year charge of 5 percent of the purchase price to cover the cost of the bond sales and land acquisition, a maintenance and insurance cost of 2 percent of the purchase price, and a payment in lieu of taxes of $10 per acre.

The cost estimate assumes that the tenant opts to purchase the land in the sixth year, which is the earliest opportunity. The bonds are retired when the land is sold. The estimate in table 1 assumes that the land is sold to the tenant at the price for which the agency purchased it. Under these assumptions, the present value of total costs is 55.37 cents per dollar invested. If the land were sold at market value and real estate had appreciated 5 percent per year, the present value of the cost would be 37.57 cents per dollar. The costs of owning and leasing the land could easily be higher than those estimated in table 1 if land values were declining, the lease were set at a use value lower than market rate, or capital improvements were required. The state would probably be under more pressure than the ordi-

nary landowner to make some capital improvements, such as building soil conservation structures. Adoption of the European practice of allowing the agency to preempt sales between nonrelatives might lower the land cost for the purchase and lease program, but this is an unlikely development in the United States.

The cost estimate of the savings subsidy program is 5 cents per dollar invested. This estimate is based on the provisions of the New Zealand Farm Ownership Savings Act (*Statutes of New Zealand,* 1974, No. 45), which offers capital grants to young farm buyers who have fulfilled the conditions of special farm purchase savings accounts. The amount of the grant is a percentage of the savings amount; the percentage rises each year to a maximum of 50 percent at the tenth year (Hill, p. 43). The estimate assumes that the young farmer saves for ten years before he begins farming and is able to finance his purchase with 15 percent equity.

If an entrant in 1981 wished to acquire the average Iowa farm real estate holding ($520,598) using a savings subsidy program, he would have to save $52,060. With a 7 percent rate of return, the entrant would have to save $3,768 annually for ten years. If riskier investments were approved for the farm ownership accounts, a smaller annual savings would be required. At 12 percent interest, $2,967 savings per year is required.

The cost estimate for tax incentives to encourage the sale of farmland to young farmers is based on the provisions of the North Dakota legislation. The base estimate assumes that all capital gains are tax-exempt; however, North Dakota rules limit capital gain exemption to the year of sale. The cost calculation assumes a 100 percent loan amortized over 20 years at 9 percent interest, the IRS minimum interest rate for sales over $500,000. The calculation assumes that the landlord's basis is $272, the 1964 Census of Agriculture average value of Iowa land. Under these assumptions, the present value of costs would be 9.82 cents per dollar invested.

If the exemption applied only to interest income, as is the case under the Minnesota legislation, the present value of costs would be 8.25 cents per dollar. If higher interest rates were allowed, the state tax loss would be greater because more interest income would be earned. If the 10.6 percent FLB interest rate for the first quarter of 1981 were used, the present value of costs would be 11.44 cents per dollar. Use of a down payment would lower the tax revenue lost by reducing interest income. No administrative cost is calculated because the program could operate through existing state revenue services with a minimum of added staff.

The cost of the tax incentive plan to lease land to beginning farmers is also based on North Dakota provisions. The lease is assumed to be for the minimum period of three years. The lease rate is the 1981 market average for Iowa, $101.80 (USDA, Farm Real Estate Market Developments, p. 19). The costs of landownership are assumed to be maintenance and insurance at 2 percent of the market value and property taxes of $10 per acre. The cost of the program is estimated at 0.89 cents per dollar invested.

Comparison of Costs: When the costs of the various programs are compared, the enthusiasm of state legislatures for farm lending programs funded by revenue bonds becomes clear. These are very low-cost programs for the state. A farmland lease and purchase program that operated as outlined would be costly for both the state and the federal government. Guarantee programs have a medium cost, but the cost may rise rapidly if a substantial number of defaults occur. Without payment adjustments, guarantee programs are relatively low-cost. If resource control is a goal without reference to landownership, the tax incentive plan for leasing is the least costly. The savings subsidy plan is the lowest-cost program to encourage real estate ownership.

It is clear that all the programs considered involve a substantial subsidy for the beginning farmer. A program that reaches enough entrants to make a significant impact on barriers to entry would require a major public expenditure. Assume, for example, that young farmers in Iowa in 1981 needed help in gaining control of about $310,000 in real estate capital. That amount of capital represents about 160 acres at the average value of $1,941 per acre. This is fewer acres than the average farm in Iowa, which could mean that the young farmer is starting with a smaller than average farm or that he or she

is providing some of his or her own capital. Under this assumption, the present value of the public cost per entrant would be direct loans, $100,700; guarantee with payment adjustment, $38,000; farmland lease and purchase, $171,600; savings subsidy, $15,500; tax exemption for interest and capital gain income from sales to beginning farmers, $30,400; tax exemption for interest income alone, $25,600; and tax incentive for leasing, $2,800. For a high-cost lease and purchase program to assist 500 entrants, the present value of all public costs would be more than $85 million if land were resold at cost. The cash cost to the state in the first year of such a lease and purchase program with 500 participants would be about $20.8 million. In contrast, a program providing tax incentives for leasing to help 500 farmers would cost the public sector about $1.4 million in present value terms with a first year cash outlay of $542,500.

Effectiveness: The estimated costs are not exactly comparable because the effectiveness of the programs is likely to vary. Programs for beginning farmers should be evaluated on criteria in addition to cost, but unfortunately data are scarce and the effectiveness of such programs is hard to measure. This study uses program costs to focus analysis on programs that are most likely to be feasible. The lease and purchase of farmland would offer the state more control than other options and hence more potential for affecting barriers to entry, but this control comes with a high price. The other programs depend heavily on decisions by prospective farmers and landowners; for example, the savings program may be the lowest-cost ownership program, but its effectiveness depends on the planning and self-discipline of prospective farmers.

In particular, the effectiveness of credit programs to aid entry has been questioned. Research on the role of alternative financing plans in the entry process is not conclusive. Hanson and Thompson found that flexible repayment of principal and longer loan terms could significantly improve the debt-carrying capacity of new farm businesses. Kaiser found that the availability of plans for deferred principal payments or increasing payments had little effect on the optimal strategy of entering farmers. Lowenberg-DeBoer found that under the most liberal conventional terms available from commercial lenders the purchase of farmland by beginning farmers has been difficult throughout the century, but there is little evidence that it was more difficult during 1978–80 than it was earlier. Under the terms of 100 percent FmHA loans, he found that debt service was often even more precarious than with conventional terms because cash flows were not large enough to cover increased interest payments, even at subsidized interest rates. On the other hand, with the terms of the Minnesota Farm Security program, the debt service position is improved by the interest subsidy and the use of conventional down payment requirements.

Although the role and effectiveness of alternative credit plans to purchase a farm are unclear, evidence points toward problems arising from rental of farms as an entry strategy. Tenancy is the traditional entry path into agriculture for the low-equity beginning farmer, but census data indicate a decline in rental of whole farm units. Some studies indicate a trend away from rental agreements with low operator equity, such as crop and livestock share rental, toward cash rental, which requires more capital and risk taking on the part of the operator (Baron, p. 28; Harsbargen, Thomas, and Rolfes, p. 5). Furthermore, established farmers with expansion plans are in a strong position in the rental market, just as they are in the purchase market. In this light, the tax incentive for leasing may be seen as a step toward neutralizing some of the advantage of an established farmer. In a crop-share-lease agreement the landlord who rents to an inexperienced farmer assumes a greater risk of crop yield variability than if he rented to an established operator. Weeds and pests may not be properly controlled; the beginning farmer may have inadequate equipment for timely field operations. Even with cash rental a landowner may still fear the development of weed problems. The reduced tax burden on rental income may offset this risk, but whether or not the tax incentive is large enough to be effective depends on the risk adversity of the landowner and his estimate of the risk involved.

Non-real Estate Capital

The analysis of costs for alternative programs to help beginning farmers obtain non-real estate capital follows a pattern similar to that of the real estate control programs (table 2). The estimates were developed for Iowa conditions in 1981 including average capital investment in livestock, motor vehicles, and equipment worth $93,236 (U.S. Department of Agriculture, *Economic Indicators of the Farm Sector,* p. 154). Like the real estate capital program estimates, the costs of non-real estate programs are a constant function of the capital requirement, except for a small administrative charge in some programs. Hence the estimates may be used under varying capital requirements.

The direct loan costs are calculated assuming a program in which administrative costs are covered by a participation fee paid by farmers, the repayment period is seven years, and the interest rate on the loan is 9.19 percent, the same as the interest rate on the bonds, as would be the case with private sale of bonds. Calculations assume that the bonds are redeemed as loan payments are made, so the bond principal outstanding is reduced by loan principal payments. Under these assumptions the present value of public costs for a non-real estate direct loan program would be 15.36 cents per dollar invested.

The guarantee program estimates were generated by adapting Minnesota Farm Security Program provisions to non-real estate. No interest payment adjustment is used in the base estimate. The calculations use a 7-year loan term, 100 percent loan, 12.9 percent interest rate, and 7 percent return on the guarantee fund. The loan interest rate is the PCA rate for the first quarter of 1981 (Melichar and Balides, p. 32). Under these assumptions the present value of public costs for a guarantee program would be 2.96 cents per dollar invested.

If an interest payment adjustment of 4 percent is used, the present value of all costs is 7.84 cents per dollar invested. In all guarantee fund estimates it is assumed that the fund reverts to the state in the last year of the guarantee. If the cost of defaults were figured into the guarantee program estimates, the costs could be expected to rise by a greater percentage in the non-real estate program than in the real estate program. Real estate has generally appreciated in value, but non-real estate could be expected to depreciate, so greater losses could be expected from defaults.

Table 2. Non-Real Estate Capital Cost per Dollar Invested[a] per Farmer under Iowa Conditions for Three Programs in 1981

	Direct Loans	Guarantees	Savings Subsidy
	(in nominal dollars)		
State cash cost first year:	0	0.0968	0.1333
Federal cost in year:			
1	0.0459	0	0
2	0.0410	0	0
3	0.0356	0	0
4	0.0296	0	0
5	0.0232	0	0
6	0.0161	0	0
7	0.0084	0	0
Present value of all government costs: [b]	0.1536	0.0296	0.1333

[a]The cost per dollar of capital that the beginning farmer is to control, assuming that the administrative charge is linear.

[b]Present value of costs of both federal and state governments per dollar invested for the life of the program.

The savings program estimates were generated by adapting the New Zealand Farm Ownership Savings Program provisions to non-real estate. The calculations are based on $93,239 of non-real estate property to be acquired with 40 percent owner equity. The full 50 percent grant after a 10-year savings period is assumed. The present value of public costs under such a savings program would be 13.33 cents per dollar invested.

An entrant who wished to acquire the average 1981 Iowa non-real estate capital worth $93,236 with a requirement of 40 percent equity would have to save $24,863 before starting farming. At a 7 percent interest rate this would require saving $1,799 annually for ten years. At 12 percent interest the annual savings would need to be $1,417. If a

savings subsidy plan were instituted for both real estate and non-real estate capital, an annual savings rate of $5,566 at 7 percent interest over 10 years would be required to save sufficient equity to purchase the average Iowa farm. At 12 percent interest the annual savings would need to be $4,382. Raising the government matching grant percentage would lower the savings required.

Effectiveness: The effectiveness of programs to help young farmers acquire non-real estate capital is closely tied to those farmers' control of real estate. Except for a few farmers who start with intensive livestock production on a small land base, a non-real estate capital program would be of little benefit unless land was available. But a non-real estate capital program may reduce the problem of undercapitalization; a young farmer with adequate equipment and livestock stands a better chance of renting land or borrowing money for real estate purchase.

Non-real estate capital programs have the advantage of offering aid to the most vulnerable group of beginning farmers: entrants with low equity who start as tenants. Trends toward increased use of equipment, specialized livestock facilities, and more nonfarm inputs have increased the capital requirements for tenants dramatically. Credit terms for non-real estate purchases have also been liberalized, but compared to the terms used for real estate purchases, the equity requirements are high and repayment periods are short. In addition, the public cost of non-real estate programs tends to be relatively modest. Under the assumptions of this study and assuming that each beginning farmer required help in gaining control of $50,000 in non-real estate capital, the present value of the public cost of helping 500 entrants would be $3.8 million for a direct loan program, $740,000 for a guarantee program without a payment adjustment, and $3.3 million for a savings subsidy plan.

Summary

Although the lack of empirical research prevents definite conclusions, this analysis suggests two major problems with the approaches chosen by state legislatures for assisting beginning farmers. The states have tended to choose relatively expensive programs, even though there is little evidence that they are more effective in aiding entry than lower-cost methods. States have also concentrated on the need for credit to the neglect of other entry problems.

Except for a direct loan provision for non-real estate credit in the Iowa program, all state entry programs in operation during the 1982 crop season addressed the problem of control of the real estate resource. The methods used were direct loans funded by revenue bonds for real estate purchase, loan guarantees to buy land with payment adjustments, tax incentives to encourage the sale of farm real estate to young farmers, and tax incentives for leasing land to young farmers. Under the assumptions of this study the direct loan, loan guarantee, and tax incentive for sale programs all had present values of public cost of over 8 cents per dollar invested. In itself, a loan guarantee program is not expensive, but the addition of payment adjustments raises costs dramatically; for example, under the assumptions of this study, the present value of public cost for a real estate loan guarantee program with a 4 percent payment adjustment is 12.27 cents per dollar invested while a simple guarantee program would have a present value of cost of 2.58 cents per dollar invested. Only North Dakota used the low-cost tax incentive for leasing approach, which has a present value of public cost under 1 cent per dollar of capital controlled. Nowhere in the United States has the high-cost land bank program been used.

The cost estimates show the direct loan programs based on revenue bonds to be the highest-cost entry programs now in use in the United States. The direct loan programs are attractive to state legislators because costs to the state are low, but the overall public cost is high. Under the assumptions of this study, such a loan program for real estate control is about three times more expensive than a guarantee program with a payment adjustment or a tax incentive program for real estate sale; about six times more expensive than a savings subsidy approach; and about thirty-six times more expensive than a program that offers tax incentives for leasing.

In addition, the fact that the majority of the cost of revenue bonds is borne at the federal level contradicts one of the arguments in

favor of state-level programs. State programs should allow voters a greater choice of programs and level of funding, but if they are based on tax-exempt revenue bonds, citizens nationwide are forced to finance a program that they have not chosen to support. State programs for beginning farmers do create some externalities, but that does not justify transferring the bulk of the cost to the federal government. From this standpoint, programs with tax incentives for sale or lease are easier to justify because the tax cost affects only the state in which the program is used.

The second major problem is that the states have focused on credit, and especially real estate credit, while neglecting other promising and less costly methods to assist beginning farmers. Although not all the programs are operational, all seven states with legislation to assist beginning farmers have created credit programs. Extension of credit has a long and successful history as a tool for helping improve farm income and living standards. But it is not clear that the problems of today's beginning farmers can be solved with more credit or more liberal credit terms.

It is often argued that the state credit programs supplement inadequate FmHA funds. The long waiting lists for FmHA loans are cited as evidence of such inadequacy. In the past, however, limited funds have been a problem primarily with FmHA farm ownership loans (LaDue (b), p. 11), and research has raised the question whether the ownership of farm real estate is critical in the entry process. The marginal entrant, on whose entry limited public funds could have the greatest impact, should probably start farming as a tenant. This entrant's problems would center on finding rental land and non-real estate capital. The only credit program likely to help such a beginning farmer would be one that assisted in acquisition of equipment and livestock; yet during the 1982 crop season only one state program provided funds for such purposes. Alternatives to credit programs might be state grants to match all or part of savings to help more entrants qualify for commercial credit, tax incentives for leasing land to beginning farmers, programs to help young farmers deal with risk, and farm management and on-the-farm training programs (Boehlje and Thomas pp. 24–25).

In general, our analysis suggests that the choice of programs raises questions of cost-effectiveness. Credit programs tend to be expensive and may not provide effective assistance. Federal credit programs clearly have faults, but duplicating those services at the state level may not be the most economical way to correct the faults. Real estate ownership programs, whether they operate through credit or tax incentives, are also costly and may ignore the needs of the entrant whose net worth is low. In light of this analysis, state legislators contemplating new entry programs or reexamining existing programs would do well to consider low-cost alternatives such as matching grants for savings and tax incentives for leasing. If a credit approach is adopted, provisions for non-real estate financing may increase the effectiveness of the program.

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Loan Pricing and Profitability Analysis by Agricultural Banks

Peter J. Barry and Jeffrey D. Calvert

Abstract

The unique characteristics of agricultural banks combined with a changing financial environment have made loan pricing and profitability analysis important banking issues in the 1980s. This article presents results from a nationwide survey of agricultural banks about their pricing and profitability analysis of farm loans. Results indicate widespread use of various pricing methods, although base rate policies, floating rates, marginal cost pricing, balances, differential pricing, and customer profitability analysis are used more formally by large banks with more complex legal structures. Structural changes in banking suggest greater use of these methods in the future.

Key words: agricultural banking, loan pricing, farm lending.

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The unique characteristics of agricultural banks combined with a changing financial environment have made loan pricing and profitability analysis important banking issues in the 1980s. Agricultural banks are generally smaller than their urban counterparts, and their activities are concentrated in more localized markets. The rural location makes these banks especially vulnerable to changes in farm income, which affect their customers' loan demands, repayment prospects, and deposit activities. Such local conditions along with the more unstable, rate-sensitive, and financially competitive environment of the 1980s, attributed in part to financial deregulation, are bringing new challenges to the balance sheet managers of agricultural banks. More market-oriented pricing and performance analyses are anticipated at the bank, department, and customer levels.

Only limited information is available about loan pricing and profitability analysis by agricultural banks. Aggregate data on terms of bank lending to farmers are published quarterly by the Board of Governors of the Federal Reserve System. Some Federal Reserve banks and the American Bankers Association also conduct periodic surveys about farm credit conditions. Studies by LaDue et al., Hardy and Moore, Schramm and Barry, and Pennsylvania State University have focused on costs of farm lending and other banking characteristics for relatively few banks in selected geographic areas. Still other studies (e.g., Knight; Reich and Neff; Simonson and Pace; Jepson and Parkinson; Flynn) have considered pricing and profitability analysis for corporate lending by larger banks.

This paper presents results from a nationwide survey of agricultural banks about their pricing and profitability analysis of farm loans. These results provide a comprehensive information base and show how these practices differ by bank size, legal structure, and involvement in farm lending. The following sections describe the study's conceptual base and survey procedures, present some of the results, and consider the implications for banks and farm borrowers.

Pricing and Profitability Concepts

Loan pricing and profitability analysis are important functions in a bank's total balance sheet (or asset-liability) management. Balance sheet management involves simultaneous consideration of assets and liabilities in structuring a portfolio to achieve desired levels of expected performance (Baker; Miller; Binder). The approach jointly considers the bank's loans, investments, reserves, deposits, borrowings, and equity capital. The volume, mix, maturity, yield, cost, risk, and liquidity of the resulting portfolio are then judged optimal.

Much of the recent emphasis in asset-liability management is attributed to greater cost-of-funds risk. Banks have responded to this risk by seeking a higher correlation between their costs of funds and the returns on loans, investments, and other assets. Such strategies as floating rates, matching maturities on assets and liabilities, fixed rate premiums, pooling funds, holding greater reserves, and financial futures have been considered and implemented in varying degrees. Effective use of these practices generally involves greater precision in a bank's accounting, pricing, and financial analysis than has previously occurred.

Within balance sheet management, the basic principles of loan pricing and profitability analysis are (a) to price loans so that their contribution to bank profits is commensurate with desired profit targets, and (b) to evaluate loans ex post to determine if profit targets were achieved (Mason, chapters 9, 10). The scope of analysis may include lending activities at the bank, department, and customer levels. In the past, loan pricing by banks was highly aggregated because of their insulated market positions, inadequate cost accounting, high costs of information about customers' credit-worthiness, and the strong role of the customer loan-deposit relationships (Baltensperger; Hodgman; Mason). At present, however, the effects of greater competition from bank and nonbank institutions, higher banking risks, computer-assisted cost accounting, and improved financial information from borrowers are all encouraging disaggregation of pricing and profitability analysis to enhance bank performance.

At the customer level, for example, loan pricing should assure that loans of individual borrowers are priced to contribute to bank profits at levels that cover the costs of administering and funding the loan, as well as compensating for lending and liquidity risks. Pricing may also reflect different degrees of competition for the customer's loan business. Pricing occurs through the explicit use of interest rates, fees, and service charges, as well as through nonprice responses such as differences among borrowers' balance requirements, loan limits, security requirements, loan supervision and documentation, and other means of credit administration.

In this study we sought to identify agricultural banks' major practices in pricing loans and evaluating loan profitability at the customer level and for their total farm lending activity. The banks responded to questions about (a) different methods of measuring costs of funds and relating them to loan rates; (b) use of floating rates; (c) varying loan maturities; (d) offering credit commitments or lines of credit; (e) requiring or recommending compensating balances; (f) levying fees or service charges; (g) charging different interest rates among customers; (h) use of customer profitability analysis (CPA); and (i) use of accounting centers for farm lending. We also considered interest rate comparisons among different bank loans and the bankers' perceptions of competition from other farm lenders. Many of these responses were analyzed according to bank size, legal structure, and involvement in farm lending. We believed that the pricing practices are influenced by these banking characteristics and anticipated that larger, less specialized banks with more complex legal structures could more readily use the more refined practices in loan pricing and profitability analysis.

Survey Methods

The data for this study were provided by a mail survey of a stratified random sample of banks in the United States that are substantially involved in farm lending. Banks with $2.5 million or more of farm loans or with a ratio of farm loans to total loans above .50 were included. On January 1, 1981, a total of 4,900 banks met these conditions. Of these banks, 1,610 were randomly selected for the survey, using a stratified sampling approach in which five geographic regions and six categories of bank farm loan volume were sampled at rates based on strata size and past response rates (Calvert and Barry).[1]

The survey responses were summarized and analyzed statistically based on analysis of variance and correlation procedures. The responses were categorized by bank size, legal structure, and degree of involvement in farm lending to analyze the effects of these characteristics on the results. Bank size is based on the dollar value of a bank's total assets. Involvement in farm lending is measured by a bank's ratio of farm loans to total loans.[2] Legal structure of each bank may be (a) statewide branching; (b) limited branching; (c) unit banking; (d) unit banking and affiliation with a multibank holding company (MBHC); and (e) limited branching with MBHC affiliation.

Survey Results

The results presented here are organized as descriptive characteristics of agricultural banks, their practices in pricing farm loans and evaluating loan profitability, and pricing relationships among loan types and between banks and other farm lenders. Significant statistical relationships between pricing practices and bank characteristics are also indicated.

Descriptive Characteristics

The survey responses came from 451 banks in 37 states representing all regions of the country; the response rate was 28 percent. Respondents appeared to be highly representative of the population of agricultural banks, as defined above, although a precise evaluation was hampered because information about their structural and performance characteristics was limited. The typical respondent to the survey appeared slightly larger in total assets, had a larger loan volume, and was more likely to be a branch bank or affiliated with a multibank holding company than was the typical agricultural bank (Calvert and Barry).

The average respondent bank held $97 million of total assets. The size distribution was heavily concentrated among smaller banks, with 50.9 percent having total assets less than $25 million and 76.3 percent having total assets less than $50 million. The average bank had $6.6 million of total farm loans, a .44 ratio of farm loans to total loans, a .60 loan-to-deposit ratio, 222 farm borrowers, and a 1.44 percent return on assets for 1980. The banks' legal structure was categorized as follows: 78.1 percent independent unit banks, 12.7 percent unit banks affiliated with a MBHC, 3.4 percent statewide branching banks, 3.6 percent limited branching banks, and 2.2 percent limited branching with MBHC affiliation.

Most banks (93.2 percent) indicated a local market for farm lending. With few exceptions, the remaining banks operated in regional markets. Consistent with their small size, most banks account for farm lending as part of their commercial or total lending

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[1] The sample was drawn by the American Bankers Association based on geographic regions and response rates of past ABA surveys. The sample size was based on an anticipated response rate of 35 percent and a tolerable error of 5 percent. A total of 451 banks responded to the survey giving an actual response rate of 28 percent.

The use of stratified random sampling meant that responses from the sampled banks were weighted according to the strata size relative to the population size of agricultural banks in order to derive means and confidence limits for the population parameters and to statistically analyze relationships among the various observations on bank characteristics (Calvert and Barry; Snedecor and Cochrane).

[2] To aid in presenting the data, the variables for bank size and farm loan ratio were categorized as follows: asset size—$0 to $10 million, $10 to $25 million, $25 to $50 million, $50 million to $100 million, $100 million to $1 billion, and over $1 billion; farm loan ratio—0 to 10 percent, 10 to 25 percent, 25 to 50 percent, 50 to 60 percent, 60 to 75 percent, and over 75 percent. Despite these categories, the tests of significance for bank size and farm loan ratio were based on continuous measures for these variables. A statistically significant negative relationship occurred between bank size and the farm loan ratio. In addition, more densely structural banks tended to be significantly larger with lower farm loan ratios.

Table 1. Determinants of Base Farm Loan Rates and Cost of Funds, Classified by Bank Size, Structure, and Farm Loan Ratio

	Base Farm Loan Rate[a]				Cost of Funds Based on[b]		
	Spread Over Funds Cost	Percent Markup	Local Competition	National Rates	Marginal Funds	In-House Funds	Both
	Percent of Agricultural Banks						
All responses[c]	58.8	30.5	44.1	8.4	8.6	76.9	14.5
Bank Size							
$0–10 million	55.7	38.6	50.0	6.8	3.7	86.4	9.9
10–25 million	64.8	33.8	40.1	5.6	5.1	78.9	16.0
25–50 million	54.4	23.7	42.1	10.5	6.2	85.8	8.0
50–100 million	60.7	32.8	39.3	18.0	12.6	73.6	13.9
100–1,000 million	51.2	17.1	51.2	9.8	22.9	39.6	37.5
Over $1 billion	53.3	22.1	47.8	25.5	52.6	26.6	20.8
Structure							
State branch	29.9	10.9	85.0	2.7	27.6	60.6	11.8
Limited branch & MBHC	91.6	17.9	55.8	21.1	0.0	14.8	75.2
Unit & MBHC	49.1	47.3	41.8	18.2	9.2	66.2	24.6
Limited branch	42.9	22.4	46.2	7.1	1.7	84.7	13.6
Unit	62.3	30.0	41.8	8.6	7.6	81.2	11.2
Farm loan ratio							
0–10%	45.9	24.3	51.4	21.6	44.0	30.5	22.5
10–25%	39.5	22.2	45.7	18.5	8.5	75.1	16.4
25–40%	70.1	32.2	39.1	6.9	6.0	78.7	15.3
40–60%	61.9	36.3	39.8	7.1	6.0	78.5	15.3
60–75%	68.4	23.7	48.7	2.6	7.5	80.5	12.0
Over 75%	57.4	42.6	46.3	7.4	3.0	93.0	4.0

[a]Methods of determining base rate differ significantly at the 5 percent level by bank size, structure, and loan ratio.

[b]Cost of funds basis differs significantly at the 5 percent level by bank size, structure, and farm loan ratio.

[c]The sum of percentages may exceed 100 because banks may use more than one determinant.

activity. Only 4 percent of the banks (predominantly larger ones) had a separate profit center for farm lending.

Cost of Funds and Base Loan Rate

One section of the survey focused on the banks' determination of base interest rates on farm loans. Included was information about relationships between costs of funds and loan rates, pooling methods, and average versus marginal costs of banks, as well as competitive responses in local and national markets. As table 1 shows, nearly 60 percent of the banks determine their base (or prime) farm loan rates as a spread over the cost of funds. About 30.5 percent use a percentage markup over the cost of funds, local competition is an important determinant for 44 percent of the banks, and only 8 percent consider national rates in pricing farm loans. These percentages total more than 100 because many banks used more than one indicator in setting base rates.

The use of these rate determinants also differs significantly among banks of different size, legal structure, and farm loan ratio. National rates were more important for larger, less specialized banks that likely lend in national markets. Local competition is a significant factor in statewide branching systems, with national rates appearing more prominent in MBHC systems. The spread and markup methods appear stronger among smaller unit banks, although the mean values in table 1 suggest fairly uniform use of the spread method across most bank categories.

Table 1 also indicates how marginal and average costs of funds are accounted for in farm loan pricing. Here marginal refers to the cost of "marginal funds to be brought in to your bank" and average refers to the cost of "funds already in your bank." Accounting

Table 2. Farm Loan Pricing and Profitability Analysis of Agricultural Banks, Classified by Bank Size, Structure, and Farm Loan Ratio

	Use Floating Rates[a,b,c]	Require Recommend Balances[b,c]	Vary Loan Maturity	Offer Credit Commitments	Fees or Service Charges	Different Customer Rates[b,c]	Use CPA[a,b,c]
	Percent of Agricultural Banks						
All responses[c]	37.6	38.9	46.9	59.7	2.1	47.0	12.6
Bank size							
$0–10 million	12.8	35.8	48.0	29.3	0.0	37.9	3.2
10–25 million	24.7	29.4	56.6	54.7	0.4	31.2	9.4
25–50 million	38.4	30.3	33.3	61.0	0.0	51.0	8.4
50–100 million	66.4	51.5	41.7	87.4	7.0	61.5	14.9
100–1,000 million	81.5	66.5	55.2	93.7	6.2	82.0	46.2
Over $1 billion	95.6	63.5	51.7	100.0	30.2	86.8	60.5
Structure							
State branch	88.9	47.3	39.9	98.7	2.8	88.7	53.3
Limited branch & MBHC	97.4	65.2	79.3	100.0	10.4	100.0	10.4
Unit & MBHC	54.2	50.9	53.5	77.3	3.7	62.5	21.9
Limited branch	50.5	65.4	42.6	93.2	6.7	64.0	25.0
Unit	30.4	35.3	45.9	52.7	1.3	40.2	8.8
Farm loan ratio							
0–10%	80.4	74.1	48.0	98.0	6.4	80.6	46.0
10–25%	61.5	46.3	36.7	74.4	3.3	63.9	21.7
25–40%	37.5	42.4	40.3	72.5	1.6	50.3	5.8
40–60%	23.2	31.2	51.5	51.9	1.3	36.4	3.9
60–75%	22.8	29.9	50.6	38.5	1.2	32.9	12.3
Over 75%	21.6	24.9	56.3	36.9	0.0	34.6	5.9

[a]Differs significantly at the 5 percent level by bank size.

[b]Differs significantly at the 5 percent level by bank structure.

[c]Differs significantly at the 5 percent level by farm loan ratio.

for the marginal cost of funds is not widespread among agricultural banks; only 8.6 percent of the banks used this method alone. About 77 percent measured the costs of funds already in the bank, and 14.5 percent use both methods of cost accounting. These cost accounting methods differ significantly among the various bank categories, however, with marginal cost accounting more prominent in the size categories above $100 million.

Most agricultural banks (73.3 percent) determine their cost of funds as a weighted average of a pool of funds. About half include noninterest costs in the weighted average; the rest do not. The more common components of the funds pool were transactions accounts, savings accounts, and various certificates of deposit (CDs). Fewer banks included repurchase agreements, federal funds, borrowed funds, and equity capital in the pool. Others (34.2 percent) closely monitored the cost of a single source of funds either along with a funds pool or as the only measure of funding costs. When a single source was used, it was predominantly the six-month money market certificate. Costs of large CDs and federal funds received minor use.

The frequency of monitoring costs of funds also differed among banks. About half reviewed their costs of funds weekly for possible adjustments in base loan rates. Monthly reviews were conducted by 29 percent of the banks, and 8.5 percent indicated daily reviews.

Loan Pricing Methods

Another major section of the survey focused on the banks' major practices in pricing loans and evaluating loan profitability, both in total and at the customer level. The results are summarized in table 2. Floating interest rates on farm loans were used by 37.6 percent of the banks in mid-1981. The use of floating rates increased significantly as bank size increased and as farm loan ratios decreased; this practice was also more common in branching and MBHC sys-

tems. The survey also indicated that 40 percent of the banks reviewed floating rate loans monthly for possible rate adjustment, whereas 16.2 percent reviewed rates on a daily basis, 18.3 percent weekly, and 13.8 percent quarterly. Nearly 90 percent of the banks did not limit the size of rate adjustment.

Compensating balances on farm loans were required or recommended by 38.9 percent of the banks, although a significantly larger number of branch or MBHC banks, as well as banks with low farm loan ratios, formally rely on balances. Balance policies also appear stronger at large banks, based on the averages in table 2, although the relationship was not statistically significant.

About 47 percent of the banks indicated they may vary farm loan maturities in loan pricing. This practice appears fairly uniform among bank sizes and legal structures, but differs significantly when banks were classified by the farm loan ratio. A joint analysis of floating rates and varying maturities indicated that 16.5 percent of the banks used both methods, 31.9 percent used neither method, 30.5 percent used only varying maturities, and 21.1 percent used only floating rates. Correlation results indicate that these two pricing practices are used independently by the agricultural banks.

About 60 percent of the banks provide credit commitments to farm customers using a master note, line of credit, or other similar arrangement. Credit commitments appear to increase with bank size, although this relationship was not statistically significant. Their use is much greater, however, among banks with low farm loan ratios and branching or holding company characteristics. Fees or service charges on farm loans were used by only 2 percent of the banks, and there were no significant relationships between fees and bank size, legal structure, or farm loan ratio.

Differential pricing among customers occurred in 47 percent of the banks; this practice was used most by banks with lower farm loan ratios and nonunit structures. Size of bank made no significant difference although averages for the size classes in table 2 indicate that larger banks are more likely to use differential pricing. Use of differential pricing was attributed by 95.7 percent of the banks to differences in customers' credit risks. Other factors associated with differential pricing include differences in deposit balances, loan maturity, loan purpose, and, to a lesser degree, loan size and market competition.

The relatively widespread use of deposit balances (62 percent of the banks involved) as a criterion for differential pricing contrasts with the relatively low incidence of requiring or recommending compensating balances on farm loans. Moreover, 38.6 percent of the banks that use deposit balances as a criterion for differential pricing do not require or recommend balances. Thus, without having a definitive balance policy, many banks offer a lower interest rate to borrowers who have larger deposit balances.

Only 12.6 percent of the agricultural banks use customer profitability analysis (CPA) or other formal methods of evaluating loan costs and revenues. The use of CPA increases significantly, however, as bank size increases and farm loan ratios decrease and in banks organized in branching and/or holding company systems.

Relationships among Loans and Lenders

The survey also elicited the bankers' responses about interest rate comparisons for different types of bank loans and their perceptions of competition from other farm lenders. These results are summarized in tables 3 and 4.

Farm loan interest rates were stated to be the same as commercial loan rates at 75 percent of the banks and lower at about 21 percent of the banks. This result is consistent with most banks' practice of accounting for farm loans as part of their commercial or total lending activity. Differences that did occur in farm and commercial rates were primarily attributed to differences in the borrowers' credit risks and to market competition. In contrast, 40.8 percent of banks indicated that farm loan rates were higher than mortgage loan rates, primarily because of differences in credit risks and market competition. Thus farm lending appears more risky and less competitive than mortgage lending; differences in lending costs and loss rates were less important for these rate comparisons.

Table 3. Interest Rate Comparisons among Farm, Commercial, Mortgage, and Installment Loans

	Commercial Loans	Mortgage Loans	Installment Loans
	Percent of Agricultural Banks		
A. Interest rates on non-real estate farm loans are:			
Higher than	3.9	40.8	23.5
Same as	74.9	45.6	30.5
Lower than	21.2	13.6	46.0
B. Rate differences are due to differences in:			
Lending costs	27.9	29.7	51.3
Credit risks	69.2	49.7	55.0
Loss rates	36.5	30.8	42.8
Market competition	55.8	43.8	23.6
Other	4.8	11.4	17.3

Table 4. Competitive Relationships between Agricultural Banks and Other Lenders

Lenders	Are They Competitors?	Interest Rate Effects?
	Percent yes	
Other banks	94.3	66.1
Production Credit Associations	90.3	46.6
Federal Land Banks	46.2	13.4
Farmers Home Administration	46.4	12.3
Life Insurance Companies	13.4	3.2
Merchants and Dealers	30.0	12.1

Rate comparisons for farm and installment loans are more diverse. Farm loan rates were higher in 23.5 percent of the agricultural banks and lower in 46 percent. Although credit risks were important in these comparisons, differences in lending costs and loss rates were more important than in commercial and mortgage lending. Thus, on balance, farm loans appear less costly and less risky than installment lending. Other factors, indicated primarily as binding usury laws on installment lending, may further explain some of the rate differences. In general, these results appear consistent with those of other studies analyzing lending costs (LaDue, et al.; Hardy and Moore).

Table 4 indicates the agricultural bankers' perceptions of competitive relationships with other farm lenders. The bankers were asked whether they consider the other lenders in their market area to be competitors and whether their loan rates were affected by those of other banks. More than 94 percent of the banks regarded other banks as competitors. The responses about competition (not shown in the table) were nearly uniform across all categories of bank size, legal structure, and farm loan ratio. The price effect from other banks appeared to increase with increased bank sizes, smaller farm loan ratios, and more densely structured banks.

In total, 90.3 percent of the banks regarded Production Credit Associations (PCAs) as competitors, with no significant differences in responses occurring across bank size, farm loan ratio, and bank structure. About 47 percent of the banks indicated that PCA competition affects their farm loan rates. This price effect tends to increase for larger banks, especially when total assets exceed $25 million, and for the statewide branching and unit-MBHC banks.

Federal Land Banks (FLBs) and the Farmers Home Administration (FmHA) were ranked next in lending competition, although considered less of a competitor than banks and PCAs. Only 12 to 13 percent of the agricultural banks indicated that FLBs and FmHA interest rates affected their farm loan rates. The low response for FLBs likely reflects their emphasis on farm real estate lending, which is comparatively minor for agricultural banks. Less competition from FmHA

was anticipated because they are considered a lender of last resort for farmers who cannot obtain credit from commercial sources. But the level of FmHA competition indicated by banks was still fairly strong and consistent with the rapid growth in FmHA lending during 1978 to 1982. Finally, merchants, dealers, and life insurance companies were considered minor sources of loan competition.

Concluding Comments

These survey results indicate that agricultural banks make widespread use of various methods of pricing farm loans and evaluating the profitability of farm customers. Moreover, the disaggregation of many of these methods to account for differences in risk, balances, and lending costs among customers appears fairly strong, on the increase, and consistent with banks' anticipated responses to greater financial competition. These responses reflect the closer integration of farm credit conditions with national market conditions as financial deregulation continues.

Many of these pricing methods are used formally by large banks in which farm lending is a relatively minor activity and by banks with more complex legal structures. This appears especially true for base rate policies, separate accounting of farm lending, floating rates, marginal cost pricing, credit commitments, balance policies, differential pricing, use of CPA, and competitive price responses to other lenders. Among the structural categories, perhaps the most noticeable differences occur between unit banks with and without MBHC affiliation. Of the MBHC-affiliated unit banks, for example, 54.2 percent used floating rates, 62.5 percent used differential pricing, and 21.9 percent used CPA; among the independent unit banks, only 30.4 percent used floating rates, 40.2 percent used differential pricing, and 8.8 percent used CPA. No significant differences in asset size occurred between these two types of banks.

These results suggest that farm loan pricing may follow the trends in bank size, geographic scope, and legal structure that characterize increasing financial deregulation. Consolidation in the number, size, and control of rural banks may continue as competition in banking markets increases and as geographic restrictions are liberalized. Farm lending, in turn, may become more concentrated in banks with $50 million to $100 million in total assets, with larger farming operations seeking larger banks.

These banking directions also suggest that farmers and other rural borrowers should anticipate pricing policies that are more commonly used by larger banks in commercial lending. Greater tailoring of interest rates to the risk characteristics, lending costs, and loan competition for individual customers will reflect the greater precision in pricing of banks' products and services. These pricing effects may seem to increase financial risks for farmers because changes in interest rates are obvious and easily measured. But higher rate variability should be offset in part by reduced swings in fund availability, which many agricultural banks experienced in the past. Nonetheless, farmers must be better prepared in financial accounting, planning, analysis, and control and be aware of trends and forces in financial markets as they compete for credit services in the future.

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Financial Impact of Mandatory Equity Programs on Farmer Cooperatives

By Jeffrey S. Royer

Abstract

Farmer cooperatives have recently been placed under increased pressure to retire patron equities. The U.S. General Accounting Office has suggested the possibility of requiring cooperatives to pay interest or dividends on retained equities and/or retire retained equities within a certain time. Analysis of the impact of these programs and two alternative programs was conducted using a deterministic growth model. The primary disadvantage of mandatory equity programs is the loss of financial flexibility that cooperatives would incur. To avoid the threat of mandatory equity programs, cooperatives need to do a better job of retiring and servicing patrons' equity.

Key words: cooperative finance, equity retirement, mandatory equity programs, cash patronage refunds, growth.

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Farmer cooperatives have recently been placed under increased pressure to adopt more effective programs for retiring patrons' equities. In some cases, former patrons and estates have voiced considerable frustration over their inability to force cooperatives to redeem their equities. As a result, mandatory programs for retiring and servicing patrons' equity have been discussed at both the state and federal levels.

The equity redemption issue follows an apparently poor record of performance by cooperatives. In their 1974 study (published in 1977), Brown and Volkin found that 29 percent of cooperatives surveyed did not have equity retirement programs. An additional 39 percent redeemed equity only in response to special circumstances. Of centralized cooperatives surveyed, 69 percent had allocated equity issued to patrons who were no longer active. In fact, 56 percent of the equity holders in centralized cooperatives were inactive, and they held 22 percent of total allocated equity (pp. 5, 22, and 23).

The absence of effective equity retirement programs has caused serious inequities in many cooperatives. Because inactive equity holders generally are not compensated with dividends or interest, they in effect subsidize the operations of the cooperative for active patrons who benefit from its services. Many of these inactive equity holders no longer have voting rights. Consequently, ownership and control are separated, and inactive equity holders do not have a voice in shaping the equity redemption policies of their cooperatives.

In its 1979 report to Congress on cooperatives, the General Accounting Office (GAO) recommended that unless cooperatives are willing to adopt voluntarily equity redemption programs that are more equitable, the secretary of agriculture should develop a legislative proposal that would make it mandatory for cooperatives to (1) pay interest or dividends on retained equities, (2) retire retained equities within a certain time, or (3) pay interest or dividends on retained equities and retire retained equities within a certain time. The GAO also suggested that, under such legislation, cooperatives with section 521 federal income tax status that did not comply with the mandatory requirements should lose that status (Comptroller General of the United States, pp. 44–45).[1]

This article examines the potential impact on farmer cooperatives of the GAO proposals for mandatory programs of equity retirement and payment of interest on retained equity.[2] It also considers the impact of two alternative programs: (a) mandatory payment of interest on only those equities held by inactive patrons and heirs of deceased patrons and (b) mandatory retirement of retained equities held by inactive patrons and heirs of deceased patrons. The effect of these programs on the percentage of patronage refunds paid in cash, rate of growth in retained equity, and/or length of the revolving period is analyzed using a deterministic growth model. Further analysis considers use of financial leverage in meeting the requirements of mandatory equity programs.

Previous Studies

Articles in three recent issues of this *Review* have concerned the financial impact of equity retirement on farmer cooperatives. Conley and Lewis evaluated the financial obstacles to equity retirement among Illinois grain marketing cooperatives. Dahl, Dobson, and Veium studied the effect of a hypothetical mandatory equity retirement plan on the solvency and financial strength of Wisconsin farm supply cooperatives. In an article on public policy issues affecting cooperative growth, Cook, Sporleder, and Dahl discussed the results of an earlier study of mandatory retirement by Dahl and Dobson.

Conley and Lewis evaluated the financial obstacles to equity retirement among Illinois grain marketing cooperatives by comparing cooperatives that had formal equity retirement programs with those that did not. Using a methodology similar to that used earlier by Brown and Volkin in a national study, Conley and Lewis based their comparisons on four measures of financial strength. They found that the financial strength of cooperatives without programs was not significantly different from that of cooperatives with programs. Consequently, they concluded that concern about financial strength should not be an obstacle to an equity redemption program (p. 58). This conclusion was similar to that of Brown and Volkin that the usual reasons for not operating an equity retirement program, including poor financial condition, had little merit (p. 30).

Unfortunately, the results of the studies by Brown and Volkin and Conley and Lewis are of limited usefulness in understanding the effect of mandatory equity programs on cooperatives. Dividing cooperatives by those that have equity retirement programs and those that do not groups together all cooperatives with programs regardless of whether they systematically redeem large amounts of

[1]The tax treatment of farmer cooperatives and their patrons is specified in Subchapter T (sections 1381–88) of the Internal Revenue Code of 1954. In determining taxable income, cooperatives are allowed deductions for qualified patronage refunds and per-unit capital retains. Per-unit retains are equities invested by patrons based on the value or quantity of products marketed and withheld from proceeds. At least 20 percent of qualified patronage refunds must be paid in cash. The noncash portion of a qualified patronage refund or per-unit capital retain is treated as if received in cash by the patron and must be taken into account in determining the patron's taxable income. In addition to qualified distributions, cooperatives meeting the requirements of section 521 of the code are allowed deductions for dividends on their capital stock or other equity capital and nonpatronage income, such as interest and rental income, distributed to patrons on a patronage basis. In 1976, 43 percent of cooperatives held section 521 tax status (Griffin et al., p. 10).

[2]The GAO report uses both the terms "interest" and "dividends" to refer to mandatory payments to equity holders. Generally, interest is a payment for the use of borrowed capital and is considered an expense in determining net margins. Dividends are distributions of net margins to equity holders. For convenience and because of their mandatory nature, payments to holders of retained equity under the GAO proposals are called "interest" in this article and are treated as interest expense in determining net margins.

allocated equities or redeem small amounts on an irregular basis. Thus it is impossible to determine the relationship between financial strength and the amount of equity that is redeemed or to isolate the financial impact of a particular plan.

Further, the fact that the financial strength of cooperatives without equity retirement programs does not significantly differ from that of cooperatives with programs does not imply that implementation of programs will not affect financial strength. Obviously, redemption of equity can affect liquidity and solvency. Just as cooperatives with equity retirement programs might have been financially stronger if they had not adopted them, cooperatives without programs might weaken their financial conditions by adopting them. To assess the financial impact of an equity retirement program on cooperatives without programs, it is necessary to compare the financial condition of the cooperatives both before and after implementation of the program.

Dahl, Dobson, and Veium used this approach in studying the effect of a hypothetical mandatory equity retirement plan on the solvency and financial strength of Wisconsin farm supply cooperatives. Under the plan, cooperatives would be required to retire each year equity capital held by members who retire, die, or leave the area served by the cooperative. The equity retired was assumed to be replaced by long-term debt. The authors concluded that the mandatory equity retirement plan could substantially reduce the solvency and financial strength of many cooperatives (p. 39).

By focusing on the plan's effect on solvency and financial strength, Dahl, Dobson, and Veium ignored potential impacts on the level of cash patronage refunds, length of revolving period, and rate of growth. The analysis reported in this article concentrates on these latter effects of mandatory equity programs. This focus was chosen because many cooperatives could be expected to try to meet the requirements of mandatory equity programs by first lowering cash patronage refunds and because increases in leverage are probably best analyzed only after limits to growth in equity are considered. Concentration on these effects also has the advantage of illustrating the trade-offs between benefits to active patrons (cash patronage refunds and growth) and inactive equity holders (equity retirement and interest on equities).

Procedure

Analysis of the impact of the GAO proposals and the two alternative programs was conducted using a deterministic growth model used in a recent Agricultural Cooperative Service (ACS) study on equity redemption (Cobia et al.) and described in a supplementary report (Royer). In the model, the level of cash patronage refunds, length of revolving period (or percentage of equity redeemed each year), and rate of growth in equity are related to the rate of return to equity (and/or the rate of deduction of per-unit capital retains). By either setting the length of the revolving period according to a mandatory requirement or reducing the rate of return to equity according to required interest payments, the values of the other variables a cooperative could maintain under a mandatory equity program can be determined.

The impact on the percentage of patronage refunds paid in cash and on the rate of growth in retained equity of the following mandatory equity plans was evaluated for a representative cooperative: (1) 5-, 10-, and 15-year revolving periods; (2) 8 percent per annum interest on all retained equities; (3) 8 percent per annum interest on retained equities held by inactive equity holders; (4) all combinations of the above revolving periods and interest policies; and (5) retirement of retained equities held by inactive equity holders for each revolving period.

Analysis was ex post: The impact of the programs was determined by comparing the estimated level of cash patronage refunds, length of revolving period, rate of growth in retained equity, and leverage of the representative cooperative in 1976 without mandatory programs with the possibilities that would have existed under the programs. Results were validated by comparing the data used to compute them with more recent data (Richardson et al.; unpublished ACS staff reports not cited in the list of references).

Estimates of the rate of return to retained equity, percent of refunds to patrons paid in cash, and rate of growth in retained equity for the representative cooperative were based on data from ACS financial profile studies for fiscal years 1970 and 1976 (Griffin et al.). These are the most recent national data available for calculating the rate of return to retained equity. Although they cover only two years, these data represent a cross-section of U.S. farmer cooperatives with respect to size, location, function, commodity classification, and tax status.

The 8 percent per annum interest rate was chosen because a majority of agricultural cooperative incorporation statutes that restrict the dividend rate paid on patron equity limit it to 8 percent (Baarda, pp. 112–13). Also, the rate paid on patrons' equity by cooperatives holding section 521 federal income tax status is limited to the greater of 8 percent and the rate (if any) established by the cooperative's state incorporation statute.

Results

Based on the 1970 and 1976 data, the representative cooperative paid 49.0 percent of patronage refunds in cash, increased retained equity at the rate of 12.2 percent per annum, and earned a rate of return to retained equity of 22.8 percent.[3] Consequently, it would have been able to maintain a revolving period of 16.4 years.[4]

Table 1 indicates the reductions in the percentage of patronage refunds paid in cash (c) or the rate of growth in retained equity (g) that would have been necessary for the representative cooperative to satisfy the requirements of the mandatory programs considered in this study. Table 1 also indicates the reduced rate of return to retained equity (r) for programs requiring payment of interest on retained equities.

Cooperatives earning less than the average rate of return to retained equity would not have been able to maintain the same levels of cash patronage refunds and rates of growth shown in table 1. Thus demonstration that the representative cooperative may have been able to satisfy the requirements of a mandatory program is not proof that all cooperatives would have been able to do so.

Mandatory Revolving Periods

Mandatory revolving periods would ensure more timely retirement of equity, benefiting former patrons and overinvested current patrons.[5] They could also significantly reduce the flow of funds available for cash patronage refunds and growth.

Figure 1 shows the combinations of patronage refunds paid in cash and rates of growth in retained equity the representative cooperative could have maintained given its 16.4-year revolving period and 5-, 10-, and 15-year mandatory revolving periods. Point b on the 16.4-year curve represents the combination of 49.0 percent cash patronage refunds and 12.2 percent rate of growth in retained equity that could have been maintained by the cooperative without a mandatory revolving period.

Points on the 5-, 10-, and 15-year curves within the rectangle abcd represent combinations of cash patronage refunds and growth in retained equity from which the cooperative could have rationally chosen while satisfying a mandatory revolving period. To maintain a 15-year mandatory revolving period, the cooperative would have had to reduce its level of cash patronage refunds to 47.0 percent, reduce its rate of growth to 11.6 percent, or lower both

[3]The estimated average rate of return to allocated equity acquired by retained patronage refunds and per-unit capital retains was used as the rate of return to retained equity. Because this figure is based on retained equity acquired in part by per-unit retains, the values presented in this article were calculated by taking into account the 2.7 percent estimated average rate of deduction of per-unit capital retains.

[4]In their 1974 study (published in 1977), Brown and Volkin found that the average revolving period of surveyed cooperatives using only systematic revolving fund plans was 9.1 years, but 68 percent of cooperatives had no systematic plans for retiring retained equities (pp. 5 and 9).

[5]The term "overinvested patron" is used here to mean a patron whose equity investment is disproportionately high relative to his or her use of the cooperative.

Table 1. Comparison of Cash Patronage Refunds and Rates of Growth in Retained Equity under Alternative Equity Programs (percent)

Program	Rate of Return to Retained Equity	Patronage Refunds Paid in Cash	Rate of Growth in Retained Equity
No manadatory equity program (16.4-yr. revolving period)	r = 22.8	c = 49.0	g = 12.2
		To meet mandatory requirements, cooperative must	
		lower—	or lower—[a]
Mandatory revolving period			
15-yr. revolving period	r = 22.8	c to 47.0	g to 11.6
10-yr. revolving period	r = 22.8	c to 33.8	g to 7.2
5-yr. revolving period	r = 22.8	c to 20.0 and g to 1.6	[b]
Mandatory payment of interest on all retained equities			
16.4-yr. revolving period	r = 14.8	c to 21.5	g to 6.7
15-yr. revolving period	r = 14.8	c to 20.0 and g to 11.9	g to 6.0
10-yr. revolving period	r = 14.8	c to 20.0 and g to 7.5	g to .5
5-yr. revolving period	r = 14.8	[c]	[b]
Mandatory payment of interest on retained equities held by inactive equity holders[d]			
16.4-yr. revolving period	r = 21.1	c to 44.8	g to 11.0
15-yr. revolving period	r = 21.2	c to 42.9	g to 10.4
10-yr. revolving period	r = 21.5	c to 29.8	g to 6.0
5-yr. revolving period	r = 22.0	[c]	[b]
Mandatory retirement of retained equities held by inactive equity holders			
16.4-yr. revolving period	r = 22.8	c to 35.1	g to 8.4
15-yr. revolving period	r = 22.8	c to 33.5	g to 7.9
10-yr. revolving period	r = 22.8	c to 22.2	g to 3.8
5-yr. revolving period	r = 22.8	[c]	[b]

[a]The representative cooperative also could have met the requirements of a mandatory equity program by lowering the percentage patronage refunds paid in cash and the rate of growth in retained equity in combination or, in some cases, by increasing its revolving period. Mandatory payment of interest on retained equities held by inactive equity holders could have been made by increasing the revolving period to 20.9 years.

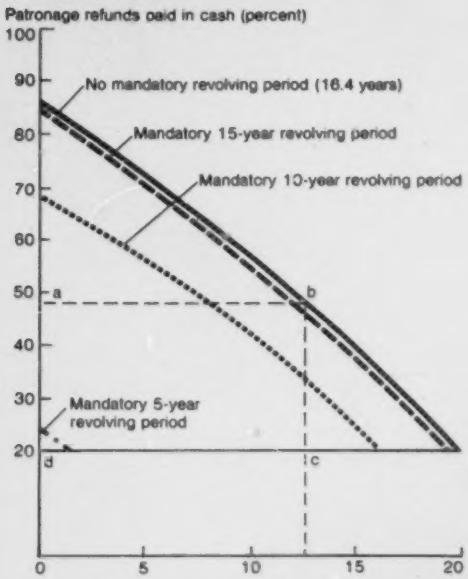
[b]A nonnegative rate of growth is not feasible given percentage patronage refunds paid in cash and length of revolving period.

[c]The 20 minimum level of cash patronage refunds and a nonnegative rate of growth are not feasible given length of revolving period.

[d]The rates of return to retained equity for mandatory revolving periods are for reductions in the percentage patronage refunds paid in cash. Rates of return for reductions in the rate of growth in retained equity differ slightly.

Figure 1

Feasible Combinations of Cash Patronage Refunds and Growth in Retained Equity Under Mandatory Revolving Periods



cash patronage refunds and growth in combination. Shorter revolving periods would have required greater reductions in the level of cash patronage refunds and/or rate of growth.

Unless active patrons were willing to accept lower levels of cash patronage refunds to meet the shorter revolving period, the cooperative's rate of growth would have had to be significantly decreased. Even at modest rates of inflation, mandatory revolvement programs could have resulted in negative real rates of growth. To maintain a 10-year revolving period without reducing the level of cash patronage refunds, the cooperative would have had to decrease its nominal rate of growth to 7.2 percent. The cooperative would not have been able to maintain a mandatory 5-year revolving period and still pay the 20 percent minimum level of cash patronage refunds without reducing its rate of growth to 1.6 percent.

This rate of growth is substantially less than the 7.3 percent necessary to offset inflation between 1970 and 1976.[6] To avoid erosion of its capital base while paying 20 percent cash patronage refunds and meeting a 5-year revolving period, the cooperative would have had to increase borrowing. The average interest rate charged by the banks for cooperatives (BCs) on term loans July 1, 1976, was 7.67 percent. Using this as the interest rate on new loans, the cooperative would have had to replace 23.0 percent of retained equity with term debt, thereby increasing its ratio of total debt to equity from 1.40 to 1.90.

Mandatory Payment of Interest on Retained Equities

Mandatory payment of interest on retained equities would benefit inactive equity holders by compensating them for use of their capital. In addition, according to the GAO, mandatory payment of interest would provide an economic incentive for cooperatives to retire equities on a more timely basis (Comptroller General of the United States, p. 43). This program could actually result in longer revolving periods, however, because of reduced cash flow.

At the end of the fiscal year 1976, cooperatives held $5.9 billion in allocated equity acquired by retained patronage refunds and per-unit capital retains (Griffin et al., p. 49). If a provision requiring cooperatives to pay 8 percent interest on retained equities was enacted, annual interest expense to cooperatives could have increased by as much as $468.6 million. This would have reduced net margins available for cash patronage refunds and equity retirement by 30.0 percent.

Longer revolving periods, lower levels of cash patronage refunds, or lower rates of growth in retained equity would have had to accompany this reduction in net margins. To meet the increased interest expense caused by mandatory payment of interest on retained equity without lengthening its revolving period, the representative cooperative would have had to lower cash patronage refunds from 49.0 percent to 21.5 percent or lower its rate of growth from 12.2 percent to 6.7 percent.

[6]The compound rate of inflation between 1970 and 1976 was 7.3 percent, based on the fixed-weighted price index for the nonresidential fixed investment component of gross private domestic investment.

Both GAO Mandatory Programs

To meet both mandatory payment of interest and a mandatory revolving period, the representative cooperative would have had to lower cash patronage refunds and/or its rate of growth substantially, as shown in table 1. The cooperative would not have been able to pay interest on retained equities and maintain a 5-year mandatory revolving period without increasing borrowing. To meet these programs and avoid capital erosion caused by inflation while paying 20 percent cash patronage refunds, the cooperative would have had to replace 45.3 percent of retained equity with term debt. This would have increased its debt/equity ratio from 1.40 to 2.65.

Mandatory Payment of Interest on Retained Equities Held by Inactive Equity Holders

An alternative to mandatory payment of interest on all retained equities is required payment of interest on only those equities held by inactive patrons and heirs of deceased patrons. With this policy, the financial burden on cooperatives would be significantly reduced, yet former patrons and estates still would be compensated for holding equity. This policy would also focus attention within cooperatives on the importance of retiring the equities of inactive patrons and provide them an incentive for doing so.

According to Brown and Volkin, 22 percent of the allocated equity of centralized cooperatives surveyed in 1974 was held by inactive equity holders (p. 21). Given this figure, mandatory payment of interest on retained equities held by inactive patrons and heirs would have required a smaller reduction in the level of cash patronage refunds or rate of growth than mandatory payment of interest on all retained equities, as shown in figure 2. If the representative cooperative were required to pay interest on only those equities held by inactive patrons and heirs, it would have had to lower its cash patronage refunds from 49.0 percent to 44.8 percent instead of 21.5 percent or reduce its rate of growth from 12.2 percent to 11.0 percent instead of 6.7 percent.

Mandatory payment of interest on retained equity held by inactive equity holders would also require smaller reductions in cash patronage refunds and growth if combined with mandatory revolving periods, as shown in table 1.[7] The representative cooperative would not be able to pay interest on retained equity held by inactive equity holders and maintain a 5-year revolving period without increasing borrowing. To meet these programs and avoid capital erosion caused by inflation while paying 20 percent cash patronage refunds, the cooperative would have had to replace only 23.0 percent of retained equity with term debt. This would have increased its debt/equity ratio from 1.40 to 1.90, considerably lower than required under mandatory payment of interest on all retained equities.

Mandatory Retirement of Retained Equities Held by Inactive Equity Holders

A second alternative to the mandatory equity programs proposed by the GAO would be mandatory retirement of retained equities held by inactive equity holders. Under this program, active patrons would supply all of the equity used to finance the services provided by the cooperative.

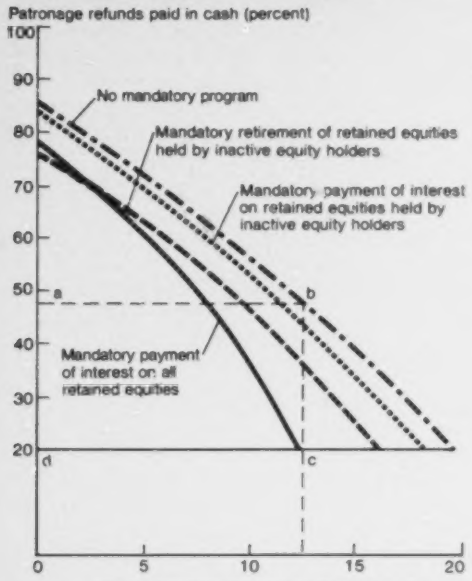
According to the model, if inactive equity holders held 22 percent of total retained equity of the representative cooperative, each year 4.0 percent of the equity would have been held by patrons who would become inactive during the year. This value was used to compute the reductions in the percentage of patronage refunds paid in cash and rate of growth in retained equity necessary for the representative cooperative to satisfy this program in table 1.[8]

As shown in table 1 and figure 2, the retirement of retained equities held by inactive

[7] If mandatory payment of interest on retained equity held by inactive equity holders was combined with a mandatory revolving period of less than 16.4 years, earlier revolvement of equity would reduce the proportion of equity held by inactive patrons and heirs. This was taken into account in computing the figures in table 1. If the rate of growth in retained equity remained the same, the percentage of equity held by inactive equity holders would fall to 10.6, 16.5, and 20.6 percent respectively for 5-, 10-, and 15-year revolving periods. But the impact would be minor, as indicated by the small differences in the rates of return to retained equity in table 1.

Figure 2

Feasible Combinations of Cash Patronage Refunds and Growth in Retained Equity Under Alternative Mandatory Equity Programs and 15.4 -Year Revolving Period



equity holders would have required less of a reduction in the percentage of patronage refunds paid in cash and/or rate of growth in retained equity than mandatory payment of interest on all retained equities but more than mandatory payment of interest on only those retained equities held by inactive equity holders.

The representative cooperative would not have been able to retire the equities held by inactive equity holders and maintain a 5-year mandatory revolving period without increasing borrowing. To meet these programs and avoid capital erosion caused by inflation while paying 20 percent cash patronage refunds, the cooperative would have had to replace 31.3 percent of retained equity with term debt, which would have increased its debt/equity ratio from 1.40 to 2.14.

Table 2. Increase in Rate of Return to Retained Equity Resulting from Debt Leveraging (percent)

Increase in Term Debt (percent)	Rate of Return to Retained Equity	Rate of Growth in Retained Equity[a]	Debt/Equity Ratio
0	14.8	5.8	1.40
25	17.5	7.7	1.71
50	21.5	10.4	2.12
75	27.6	14.3	2.67
100	38.6	20.7	3.46

[a]Given 50 percent level of cash patronage refunds and 15-year revolving period.

Use of Leverage

Cooperatives that have unused borrowing capacity might be able to offset some of the impact of mandatory equity programs by substituting term debt for retained equity. At the end of fiscal year 1976, cooperatives held $3.6 billion in term debt (Griffin et al., p. 29). The representative cooperative had a ratio of total debt to equity of 1.40. If 8 percent per annum interest on retained equities is assumed, the cooperative would have had a 14.8 percent rate of return to retained equity. This rate of return would have allowed the cooperative only a 5.8 percent rate of growth in retained equity given 50 percent cash patronage refunds and a 15-year revolving period.[9]

Table 2 shows the increases in the cooperative's rate of return to retained equity, rate of growth in retained equity, and debt/equity ratio resulting from replacement of retained equity with term debt. By increasing term debt by 25 percent (which would allow a 15.3 percent reduction in retained equity), the cooperative would have been able to increase its rate of return to 17.5 percent and thereby its rate of growth to 7.7 percent. This action would have increased its debt/

[8]Dahl, Dobson, and Veium estimated that for 1966–74 between 8.48 and 9.14 percent of equity in Wisconsin farm supply cooperatives was held by members who retired, died, or left cooperatives each year (p. 32). These figures were not used in this analysis because, according to the model, they would imply that between 38.8 and 40.9 percent of retained equity was held by inactive equity holders.

[9]Use of 50 percent cash patronage refunds and a 15-year revolving period is not entirely arbitrary. The original bill for the Tax Reform Act of 1969 included provisions that would have required cooperatives to pay 50 percent of qualified patronage refunds in cash and to redeem the noncash portions of qualified patronage refunds and per-unit capital retains within 15 years of allocation.

Table 3. Comparison of Rates of Return, Rates of Growth, Interest Rates, and Debt/Equity Ratios (percent)

Estimate	Year(s) 1970/1976	1977/1979/1980	1981
Average rate of return to total assets	8.9	7.7	4.9
Average rate of return to total equity	19.0	17.7	12.8
Compound rate of growth in total assets	13.9	15.8	− 2.0
Compound rate of growth in total equity	11.8	9.5	3.1
Average interest rate on term loans charged by BCs July 1 of last year in period	7.67	12.35	14.10
		Ratio	
Debt/equity ratio at end of last year in period	1.40	1.78	1.64

Source: Computed from Richardson et al., unpublished ACS staff reports, and data supplied by Farm Credit Administration.

equity ratio to 1.71. Greater increases in term debt shown in table 2 would have further increased the rate of return but would have also resulted in higher debt/equity ratios.[10]

Comparison with Recent Data

Although data necessary for computing the rate of return to retained equity do not exist for fiscal years after 1976, more recent data are available for computing estimated rates of return to total assets and total equity (Richardson et al.; unpublished ACS staff reports not included in list of references). These rates, estimated compound rates of growth in total assets and total equity, average interest rates on BC term loans, and debt/equity ratios for 1977, 1979, 1980, and 1981 are compared to corresponding data for 1970 and 1976 in table 3.

The average estimated rates of return to total assets and total equity were lower in the period from 1977 to 1980 than in 1970/1976 and fell significantly in 1981. Preliminary data indicate that these rates will be even lower for 1982.

Recent rates of growth in total assets have been higher than for 1970/1976 (except for 1981 when there was a decline in assets). The rate of growth in total equity, however, has declined since 1976 and has been lower than the rate of growth in total assets. This decline is reflected in the debt/equity ratio, which has risen from 1976 until 1981.

The lower rates of return to total equity probably have been accompanied by lower rates of return to retained equity. Thus cooperatives probably would have had a diminished ability to pay cash patronage refunds and sustain growth in retained equity under mandatory equity programs.

Although cooperatives have generally increased their leverage since 1976, the rate of return to total equity has declined, probably because of the effects of rising interest rates and lower returns on assets. The ability of cooperatives to take on more debt in the future to increase their rates of return and improve their ability to service equity may be compromised because many cooperatives may be approaching limits to their borrowing capacity (as evidenced by the debt/equity ratios in table 3). Further, the borrowing that can take place may be necessary for

[10]Recent higher interest rates would have substantially reduced the ability of cooperatives to meet mandatory equity programs through increased leverage. Given the average July 1, 1981, BC interest rate on term loans of 14.10 percent, a 25 percent increase in term debt would have increased the representative cooperative's rate of return to 16.4 percent and its rate of growth to 6.9 percent.

continued growth in assets (as indicated by the greater rate of growth in total assets than in total equity in recent years).

Lower rates of return to equity, higher rates of growth, increased leverage, and the financially difficult years of 1981 and 1982 all indicate that cooperatives would have been less able to satisfy the requirements of mandatory equity programs recently than they were between 1970 and 1976. As a result, this study may be conservative in estimating the impact of mandatory equity programs.

Conclusions

Mandatory revolving periods would ensure more timely retirement of equity, benefiting former patrons and overinvested current patrons, but they would also significantly reduce funds available for cash patronage refunds and growth. Mandatory payment of interest on retained equities would benefit inactive equity holders by compensating them for use of their capital. In addition, according to the GAO, mandatory payment of interest would provide an economic incentive for cooperatives to retire equities on a more timely basis. This program would also reduce funds available to cooperatives and could actually result in longer revolving periods.

An alternative to mandatory payment of interest on all retained equities is required payment of interest on only those equities held by inactive patrons and heirs of deceased patrons. With this policy, the financial burden on cooperatives would be significantly reduced, yet former patrons and estates still would be compensated for holding equity. A second alternative would be mandatory retirement of retained equities held by inactive equity holders. This alternative would place more financial burden on cooperatives than mandatory payment of interest on retained equities held by inactive equity holders but less than mandatory payment of interest on all retained equities.

The primary disadvantage of mandatory equity programs is the loss of financial flexibility cooperatives would incur. Equity capital usually serves as the basis for credit and a buffer for creditors should the business experience operating losses or shrinkage in asset values. Without mandatory equity programs, a cooperative that encounters a series of difficult years can temporarily slow down retirement of equity or payment of dividends on retained equity until it regains its financial strength. Under mandatory equity programs, however, the cooperative would be required to service equity in a manner similar to debt, diminishing its capacity to absorb the uncertainties of the business environment. In addition, concern among lenders, who might view the commitment to service equity as a threat to cooperatives' ability to service debt, could reduce the availability of credit.

Some cooperatives might be able to meet the requirements of mandatory programs by accumulating additional equity capital through direct investments, increased retained patronage refunds, per-unit capital retains, or by substituting debt for redeemed equity. Despite the best intentions of membership and management, however, other cooperatives might not be able to generate cash flow adequate to replace redeemed equity. Exceptions to mandatory programs could be made for financially weak cooperatives, but definition and enforcement of rules for determining exceptions would be difficult.

Because of the threat of mandatory equity programs, cooperatives need to do a better job of retiring and servicing patrons' equity if they are to maintain flexibility in managing their financial affairs. At a minimum, cooperatives should consider voluntarily retiring the equities of inactive equity holders or paying dividends on these equities until they are redeemed.

Cooperatives should also consider adopting comprehensive programs of equity formation and redemption that can be used in financial budgeting and planning.[11] Difficulty in implementing and maintaining a program may be an indication that current patrons are not contributing adequate amounts of equity. If current patrons are unwilling to finance the cooperative without relying on free capital provided by inactive equity holders, they may need to consider whether the services provided by the cooperative are necessary.

[11]For detailed discussion of alternative plans for equity formation and redemption, see Cobia et al., pp. 21–56.

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Cooperative Equity Redemption Plans and Financial Strength: New Empirical Evidence

Mark D. Newman

Abstract

This article examines specific types of equity redemption policies and associated financial performance of Kansas grain marketing and supply cooperatives. Policies are evaluated at a more disaggregated level than in previous work. Significant differences in size, inactive membership, solvency, financial leverage, and profitability are identified.

Cooperatives maintaining revolving fund programs were significantly stronger than all others, although cause and effect were not identified. This study concludes that, although many cooperatives have been able to adopt policies for equity redemption, financial strength of cooperatives differs sufficiently that specific types of mandatory equity redemption would cause problems for some cooperatives.

Key words: cooperatives, cooperative equity, cooperative finance, equity redemption.

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Introduction

In recent years there has been considerable discussion of whether patronage and ownership of cooperatives by their members have been close to proportional, a practice basic to cooperative principles. Equity investments of farmers who stop using cooperatives have not always been redeemed or adjusted downward and replaced by equity capital from current users (Brown and Volkin). A Government Accounting Office (GAO) report has suggested that cooperatives remedy this situation voluntarily or that legislation mandate either redemption or dividend payments on retained equities (GAO). As the average age of cooperative members becomes increasingly older, equity redemption—recently characterized as a "ticking time bomb" facing cooperatives (Ginder)—remains a major public policy issue.

A number of studies have attempted to document equity redemption policies of cooperatives (Brown and Volkin; Conley and Lewis; GAO) and evaluate the impact of mandatory equity redemption on cooperative financial strength (Conley and Lewis; Cook; Dahl, Dobson, and Veium, 1981, 1982). Two previous studies published in *Agricultural Finance Review* reached conflicting conclusions on the impact of mandatory redemption. Conley and Lewis concluded that "grain cooperatives without equity redemption programs did not have significantly more difficult financial obstacles to equity redemption than did cooperatives with such programs." Dahl, Dobson, and Veium, on the other hand, concluded

that mandatory equity retirement could substantially reduce the solvency and financial strength of many Wisconsin farm supply cooperatives.

Previous studies have hypothesized impacts of specific mandatory equity redemption programs on cooperative financial strength. In contrast, this article provides new empirical evidence on equity redemption programs and associated financial performance. Programs are disaggregated to a level not available in previous work. Although it is not possible to prove causal relationships between types of equity retirement programs and financial performance, the evidence presented here is descriptive and suggestive. Such evidence gives focus to questions regarding cooperative financial performance and control, and it suggests the potential impact of mandatory equity redemption. Possible reasons for contradictory findings are also discussed.

Study Procedures

In November 1981 a questionnaire was mailed to managers of all 241 grain marketing and supply cooperatives in Kansas. Managers were asked to answer questions and to supply financial data equivalent to balance sheets and income statements for a two-year period. Such data are generally distributed at cooperative annual meetings. A follow-up letter was sent, and an announcement urging completion of the questionnaire appeared in the newsletter of the Kansas Cooperative Council. The response rate of completed questionnaires was 32 percent.

A telephone survey was then taken of a 20 percent random sample of nonrespondents using an abridged questionnaire. There was a 96 percent response rate to the telephone survey, and 80 percent of respondents provided financial data. In case of statistically significant differences in characteristics of respondents and nonrespondents to the original survey, such as variables related to size and types of equity redemption policies, a weighting procedure was employed using telephone survey data to estimate nonrespondents' attributes. Otherwise, data from the two surveys were pooled. Financial data evaluated here are for fiscal years ending during the July 1, 1980–June 20, 1981, period. This period was selected to coincide with a single wheat marketing year. Nonresponse bias in this survey and the weighting procedure used are discussed elsewhere (Newman; Newman and Stephens). Overall, 45 percent responded to either the initial survey or telephone follow-up and 37 percent provided financial data.

Equity Redemption: Kansas in Perspective

As user-owner businesses, farmer cooperatives are taxed according to a single tax principle that looks through the cooperative to tax the joint user-owners, who in principle receive all of the benefits. To qualify for single tax treatment, cooperatives must allocate their profits, called savings in cooperatives, to their patron/owners on an annual basis so that they are taxed at the level of the individual member. In addition, for single tax treatment at least 20 percent of these savings must be distributed in cash and the rest in stock certificates, equity certificates, or equity ledger credits. The noncash allocation then constitutes an ownership interest in the cooperative on which the member becomes liable for taxes. Retained patronage refund allocations are one way that cooperatives build equity capital (Beierlein and Schrader; Fenwick). Equity redemption or retirement is the process by which the equity ownership interests of individual members are redeemed. Maintenance of a strong cooperative requires that redeemed equity be replaced by equities from other users. Therefore, equity redemption is one facet of overall equity management.

Cooperatives that redeem equities follow several approaches including retirement: (1) exclusively to the estates and deceased members; (2) in "special" circumstances such as when farmers move away from the community, stop farming, or stop patronizing the co-op; (3) when patrons reach a predetermined age; (4) on a first-in, first-out revolving fund basis; (5) according to equity ownership in excess of the proportion of total business accounted for by the member (base capital plan); or (6) on a straight percentage basis. These approaches are

described in greater details in Cobia et al. Only the first four approaches are widely used in Kansas.

Most of the empirical evidence on equity retirement in cooperatives has been based on work by Manuel in Kansas in the 1950s, a 1974 national survey by Brown and Volkin, and a 1978 survey in Illinois by Conley and Lewis. The more recent studies make very limited distinctions among types of equity redemption plans used by cooperatives. Brown and Volkin categorize cooperatives as having systematic, special, or no programs. Conley and Lewis distinguish only between cooperatives with and those without programs. The study reported in this paper sought further to disaggregate equity retirement plans and associated financial performance. It was hypothesized that such an analysis could add new insights to discussions of the state of cooperative equity redemption and the impact of mandatory equity redemption on cooperative financial strength. Results of this study provide sharp contrast to Manuel's finding that in 1950 only 10 percent of all cooperatives had adopted some policy for equity retirement. In 1981 more than 99 percent of Kansas cooperatives reported a policy to redeem equities. This percentage is the highest reported in the literature to date. Almost all cooperatives redeem equities belonging to estates, but 13 percent redeem only to settle estates. Twenty-four percent have either an estate settlement program or a combination of estate settlement and a "special" program. Forty-four percent redeem the equities of those who stop farming, and 52 percent redeem equities of those who move away from the community. Twenty-three percent of all cooperatives have a revolving fund for equity retirement. Sixty-four percent of all cooperatives have an age retirement program but no revolving fund. Only 13 percent employ a revolving fund exclusively. (These numbers do not add to 100 percent because many cooperatives employ multiple programs.)

Age-based retirement programs are probably more prevalent in Kansas than in some other states because the largest federated regional cooperative with membership in the state retires ownership equities to local cooperatives on the basis of age of local members. This policy provides a strong incentive for locals to employ an age-based program.

Equity Retirement Programs and Financial Performance

Size, financial performance, and variability were examined across the range of equity redemption policies used by Kansas cooperatives. The study provides insights into financial strength associated with cooperatives employing specific policies and indicates potential obstacles to the adoption of more systematic procedures by cooperatives with restricted programs.

This article emphasizes comparisons between financial performance of cooperatives falling into each of three equity retirement policy categories and all other cooperatives. Table 1 summarizes mean values for all cooperatives and cooperatives with policies that provide for (1) estate settlement and/or redemption under special circumstances (except age); (2) redemption based on age, either alone or in conjunction with any other factor; and (3) redemption according to a revolving fund, either exclusively or in conjunction with some other program. Results of further disaggregation are reported in the text below.

Tests of the null hypothesis that mean values of individual characteristics are equivalent for cooperatives with a given equity redemption policy and all other cooperatives were conducted. In cases in which it was concluded that variances in each population are equivalent using an F-test, a standard t-test was used to draw inferences concerning equivalence of means. If variances were concluded to be unequal on the basis of an F-test, an approximation of a t-test was employed. T-tests for small sample sizes are based on the assumption that samples are drawn from populations that are normally distributed for the characteristic under study. Such an assumption is required to draw inferences based on groupings of equity redemption policies at a more disaggregated level than presented in table 1. It is also required for inferences reported in at least the study by Conley and Lewis.

Table 1. Size, Financial Performance, and Equity Retirement Policies of Kansas Cooperatives, 1980–81[a]

Variable	Equity Retirement Policy Category			
	Estate Settlement and/or Special Circumstances	Age-Based and Any Other	Revolving Fund and Any Other	All Cooperatives
Total assets ($)	2,010,084	4,878,864	4,147,869	3,511,376
	(.0001)	(.005)	(.94)	
Total sales ($)	5,467,696	11,625,915	10,430,409	8,770,121
	(.0002)	(.009)	(.89)	
Number of members	915	1,320	1,095	1,098
	(.24)	(.15)	(.56)	
Inactive members (%)	24.0	19.4	18.1	21.0
	(.13)	(.62)	(.45)	
Cash patronage dividends (%)				
1980	24	30	31	26
	(.02)	(.29)	(.15)	
1981	24	29	32	25
	(.04)	(.42)	(.09)	
Equity/assets	.57	.55	.63	.58
	(.97)	(.12)	(.04)	
Current ratio	2.07	1.56	1.88	2.04
	(.39)	(.05)	(.61)	
Total debt/equity	.88	.98	.68	.84
	(.83)	(.07)	(.01)	
Long-term debt/equity	.32	.25	.16	.24
	(30)	(.72)	(.001)	
Local operating margin (%)	1.80	1.82	3.06	1.78
	(.71)	(.33)	(.03)	
Return on assets (%)	9.28	9.07	11.80	10.09
	(.68)	(.10)	(.09)	
Return on equity (%)	14.99	16.10	18.73	16.54
	(.34)	(.46)	(.19)	
Total savings generated locally (%)	52	47	49	49
	(.77)	(.30)	(.99)	
Cooperatives reporting policy (%)[b]	24	64	23	100

[a]Figures in parentheses represent p-values for tests of significance of differences from other cooperatives.

[b]Percentages sum to more than 100 because cooperatives fall into multiple categories.

In hypothesis testing it is common practice to select arbitrarily a maximum .10 probability of type I error (concluding that a difference in population characteristics exists when it does not) for presentation of differences as statistically significant. Nonetheless, for many purposes conclusions of differences with a .11, .20, or greater probability of type I error would be of equal interest to researchers concerned with equity redemption issues. For this reason, p-values are presented in table 1. These are the actual or approximate probability of type I error if it is concluded that mean values differ for cooperatives with a given policy and all others. This complicates the process of identifying differences as "statistically significant" but provides readers with more information with which to interpret findings. It is also in line with current thinking in the statistics literature.

Estate Settlement and Special Cases

Cooperatives providing for redemption of equities only to estates or in special cases (E/S) as defined above can be classified as the least systematic in their abilities to plan for equity redemption expenditures. In comparison to others, E/S cooperatives had smaller asset bases, smaller total sales volumes, smaller numbers of members, and a higher percentage of inactive members. These cooperatives also paid a lower per-

centage of patronage dividends in cash than other cooperatives. These differences were most significant for cooperatives settling estates only.

Cooperatives in the E/S group did not differ greatly from others in overall financial strength although their long-term debt obligations as a share of members' equity were double the ratio for cooperatives with revolving funds. Average current ratios, solvency ratios, and financial leverage are within ranges generally accepted as indicating sound financial condition. Nonetheless, long-term debt service requirements pose a potential problem for some E/S cooperatives. Borrowing to finance equity retirement program development could exacerbate this threat. Twenty-nine percent of E/S cooperatives had more debt than equity, while 11 percent had long-term debt obligations amounting to more than .5 of member equity.

Local operating margins, net savings generated at the local (compared to regional) cooperative level, as a percentage of total sales, are one measure of profitability. They were not significantly different for cooperatives with less systematic equity retirement policies than for others. Though sample means for returns on assets and equity were below those for other cooperatives, the differences are not large enough to infer significant differences between groups. In the sample, profitability was slightly lower for cooperatives with "special" programs than for those without such programs. In general it can be argued that factors associated with cash flow and financial leverage affect the ability of some cooperatives to adopt more systematic programs but do not limit the ability of all E/S cooperatives to do so.

Age-Based Equity Redemption

Redemption programs based on age of the cooperative member have been termed "special" equity redemption programs in past studies (Brown and Volkin). In Kansas, the primary regional cooperative in which local cooperatives hold ownership interest is Farmland Industries. Farmland instituted an ownership retirement program early in the 1970s, basing redemption of local cooperative equity in the region on the age of members of local cooperatives. If a local cooperative systematically retires the equities of members aged 65 or above, Farmland will redeem a share of those equities to the local proportional to the share of local equities invested in Farmland (provided that Farmland's profits permit it). Because this program has been interpreted to require that equity redemption at the local cooperative level be based on age, many cooperatives in Kansas have adopted an age-based program, at least for the record, and often in conjunction with other forms of equity retirement policies. Sixty-four percent of all cooperatives have age-based retirement programs, either exclusively or in combination with revolving funds, special programs, or estate settlements.

Age-based equity redemption programs permit cooperatives to hold the equity investments of members for long periods of time. At recent interest rates, the net present value of retained patronage dividends to many younger members under age-based programs approaches zero and, once taxes are paid, can become negative. Supporters of age-based retirement programs often argue that cooperatives on such programs tend to pay a higher percentage of patronage dividends in cash to compensate for this shortcoming. Survey results do not provide strong support for this view. Cash patronage dividends paid by responding cooperatives using age-based retirement programs were larger than those for cooperatives as a whole but smaller than those paid by cooperatives on revolving fund programs.

Cooperatives using age-based programs are significantly larger than other cooperatives in total assets and total sales. Among those responding to the survey, however, there was no perceptible difference in membership size.

Age retirement programs are sometimes criticized because they may not maintain ownership interest in the hands of current users of the cooperative if members become inactive (stop using the cooperative) before the retirement age established for equity redemption. Membership inactivity among those cooperatives responding was not sufficiently below the mean for all cooperatives to infer a significant difference. Membership inactivity, reported at 19.4 percent, was still

high. This figure is very close to the 18.6 percent membership inactivity rate reported by Manuel in 1950.

Despite the criticism mentioned above, for cooperatives with no equity redemption policies, the adoption of an age-based program is an important improvement. Furthermore, if members steadily increase their use of the cooperative until they reach the target retirement age, they could be expected to maintain a share of capital in the cooperative proportional to use as a result of retained patronage allocations. Imbalances will remain between younger members and older members who have decreased their use of the cooperative.

Previous studies have not evaluated the financial characteristics and performance of cooperatives that use age-based equity retirement policies. Analysis of the financial ratios for solvency, liquidity, debt obligations, and profitability of cooperatives responding to the survey indicate that those using age retirement programs did not perform as well as others. The ratio of owner equity to total assets was smaller for cooperatives on age-based plans than for others, though still within acceptable ranges. Liquidity or working capital, represented by the current ratio, was significantly below that for all other cooperatives and approached the lower bound of an acceptable range. The ratio of total debt to equity and the ratio of long-term debt to total equity were slightly higher than average compared to other cooperatives—the former sufficiently so to permit inference of significant difference.

Thus cooperatives using age retirement programs were somewhat less solvent and significantly less liquid with a somewhat greater overall debt burden than cooperatives without such programs. The available data do not permit evaluation of whether these factors are the result of adoption of an age-based retirement program or merely associated with the type of cooperative that is most likely to adopt such a program. They do indicate that cooperatives using age-based retirement programs should carefully evaluate their annual equity retirement decisions in the context of implications for solvency, liquidity, and use of financial leverage.

Profitability is another important measure of the ability of local cooperatives to continue to redeem the equity of inactive members. For cooperatives with an age-based program in conjunction with any other, profitability measured by return on assets (9.07 percent) was significantly different from that of other cooperatives. For cooperatives with either an age-based or "special" program but without revolving funds, local operating margins (1.56 percent) and return on assets (8.90 percent) were significantly different from those of all other cooperatives, although returns on equity were not. The latter group of age-program cooperatives is most comparable to cooperatives with "special" programs reported on by Brown and Volkin.

It was hypothesized that weak margins at the local level would tend to increase dependence on regional cooperative participation to implement equity retirement programs. This could strengthen incentives for locals to adopt a policy permitting participation in regional ownership retirement. The observed difference in the percentage of total net savings made up by local net savings was not great: 47 percent for the age-based group and 49 percent for all cooperatives.

Revolving Fund

A final group of cooperatives studied maintain a revolving fund either alone or in combination with some other equity retirement policy. They were not significantly different in total assets, total sales, or total membership from other cooperatives. Among those responding, the percentage of inactive members was slightly smaller than for other cooperatives, but this difference was not statistically significant. Cash patronage dividends paid were higher in 1980 and 1981 than for other cooperatives, averaging 31 to 32 percent.

The solvency, liquidity, and financial leverage of cooperatives with revolving funds were significantly stronger than for others. Owner equity averaged 63 percent of total assets for those with revolving funds in combination with any other program and 68 percent for those with revolving funds exclusively. Liquidity was significantly better for those exclusively on a revolving fund with

current assets 2.29 times current liabilities. Financial leverage, measured by total debt to net worth and term debt to net worth, was also significantly smaller. Cooperatives on revolving funds exclusively average 50 percent debt to equity and 17 percent long-term debt to equity; this compares with 84 percent debt to equity for all cooperatives and 24 percent long-term debt to equity for all cooperatives.

Profitability levels were also higher for cooperatives on revolving funds. Local operating margins of 3.06 percent for those on revolving funds in combination with other programs were almost double the margins obtained by other cooperatives. Locally generated savings appear to have been central to the ability to maintain a revolving fund in the past and can be expected to continue to be so in the future. It was not possible to discern whether higher local margins resulted from higher prices to members or from more efficient operation. Returns on assets and returns on equity were also higher, averaging 20.8 percent for cooperatives with only a revolving fund and 18.7 percent for those combining revolving funds with other programs. Although the results reported above indicate a statistically significant association between revolving funds and financial performance that is better than that of other cooperatives, they do not necessarily imply that adoption of a revolving fund leads to improved financial performance. A more plausible explanation might be that only the strongest cooperatives have been able to maintain a revolving fund in the face of inflationary capital requirements during the past decade. Some observers argue that maintaining revolving funds will be even more difficult in the future.

Conclusions

Compared with the situation found by Manuel in 1950, the present study found that cooperatives in Kansas have made important strides toward the development of equity redemption programs to maintain ownership by current users. The results of the study underscore the essential linkage between financial strength and the ability to redeem equities in a systematic fashion. Contrary to findings projected by some previous studies, adoption of equity retirement programs has not impaired the financial health of many cooperatives in Kansas. At the same time there is evidence that imposition of more systematic equity redemption programs would place a financial strain on some cooperatives in Kansas that are already taxed by limited liquidity and excessive financial leverage. The ability to disaggregate equity redemption plans and compare financial performance of cooperatives with and without individual policies provides insights not previously available when examining only the presence or absence of undefined equity redemption programs. There remains, however, considerable opportunity to seek greater precision in understanding linkages between equity management, financial performance, and the ability to maintain ownership by members in proportion to use of the cooperative.

In undertaking this study, it was expected that revolving fund programs would be the most effective in maintaining the burden for supplying ownership capital with current users of the cooperative. It was also expected that cooperatives with age-based equity redemption programs would be less effective. Analysis of this factor indirectly through reported percentages of inactive members failed to identify significant differences between each of the two groups and all other cooperatives. Furthermore, analysis of the distribution of members' ages and equity holding by age categories failed to indicate significant differences between cooperatives on revolving funds and cooperatives with age-based equity redemption programs. Cooperatives on revolving funds reported 23 percent of their members age 65 or over holding 24 percent of equity ownership in the cooperative, while those with age-based programs reported 22 percent of members age 65 or over holding 22 percent of their equity. Based on these findings, it is not possible to conclude that there are strong differences between cooperatives with revolving fund and age-based equity retirement programs in conforming to the principle that ownership in cooperatives should be proportional to their use. But in terms of solvency, financial leverage, and local operating margins, cooperatives operating revolving funds were significantly stronger than others.

Cooperatives that redeem equities to estates of deceased members either exclusively or in combination with one or more special cases such as moving away from the community, quitting farming operations, or becoming inactive were smaller than others in assets, sales, and membership. They also had a larger percentage of inactive members and paid a significantly smaller portion of patronage dividends in cash. Otherwise, financial performance as measured by solvency, financial leverage, and profitability was not significantly different from that of cooperatives with other types of equity redemption programs.

Compared with other cooperatives, however, the E/S group has an older membership holding a larger share of equity ownership. Thirty percent of members were reported to be age 65 or older, and they held 34 percent of owner equity in the cooperative. These factors indicate that equity redemption is likely to pose a major problem for E/S cooperatives in the future. Even though they have a policy to handle equity redemption, E/S cooperatives will require significant growth or borrowings to be able to retire equities belonging to estates and in other special cases as they arise. This, then, is the "ticking time bomb" mentioned earlier.

How do the results of this study relate to those reported previously? First, they confirm Brown and Volkin's contention that cooperatives can establish a policy for equity redemption. Almost all Kansas cooperatives have adopted a policy to provide for equity redemption, although many involve reaction to special circumstances rather than systematic planning for replacement of equity capital investments of old users with those of current users. In 1950, only 10 percent reported a policy (Ginder).

Second, there is support for Dahl, Dobson, and Veium's conclusion that mandatory equity redemption could impose a financial strain on some cooperatives, especially if the mandatory program obliged more systematic approaches than are currently practiced. The Kansas cooperatives in the strongest financial positions have the most systematic equity redemption programs. It is not possible to tell whether good financial conditions cause the equity retirement policy or vice versa, but they certainly would facilitate such policies.

Although some observed aspects of financial performance support Conley and Lewis's finding that financial performance is unrelated to equity redemption policy, potential impediments to equity redemption were also identified. As has been pointed out elsewhere (Newman and Stephens), nonresponse bias in Conley and Lewis's survey might explain some of the financial strength they observed, especially if cooperatives in the strongest financial condition were the most likely to respond to the survey. The extent to which this was the case cannot be confirmed without sampling those that failed to respond to the survey.

In conclusion, mandatory equity retirement remains less desirable than initiatives by cooperatives to maintain ownership by current users. The number of Kansas cooperatives with a policy for dealing with equity redemption has increased markedly since the issue was first studied thirty years ago. Cooperatives with the most systematic equity redemption programs are also in the strongest financial position, which supports the idea that sound financial management is critical regardless of equity redemption policy. With an eye toward the future, some Kansas cooperatives are strong enough to make their equity redemption policies more systematic, but others are not. As many previous authors have pointed out, one key to the development of successful equity redemption programs by local cooperatives is to maintain a balance in the equitable treatment of past, present, and future members of the cooperative. Such a balance is a key consideration regardless of the type of equity retirement program adopted.

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Influence of the Farm Credit System Stock Requirement on Actual Interest Rates

Eddy L. LaDue

Abstract

Variability exists in the specific stock requirement plans of Federal Land Bank and Production Credit Associations. The stock requirement increases the annual equivalent rate by one-half to two percentage points depending on the level of the stock requirement, the interest rate, whether automatic or end-of-period cancellation is used, and other factors. Farm Credit System rates should be adjusted for the stock requirement when being compared to other rates at both the farm and national levels. National average Federal Land Bank rates, after adjustment for the stock requirement, have remained below commercial bank long-term real estate rates for the past several years.

Key words: Farm Credit System, agricultural finance, credit, stock, interest rates, cooperatives, equity capital.

The Farm Credit System is an interconnected set of cooperative organizations owned by their borrowers. Ownership is effected by requiring each borrower to purchase stock in the cooperative in amounts proportional to the amount of funds borrowed. The stock provides a major portion of the equity capital required to finance production credit associations (PCAs) and federal land bank associations (FLBAs) as well as district federal intermediate credit banks (FICBs) and federal land banks (FLBs).[1] This equity capital provides the capital base that enables the Farm Credit System to sell its securities to investors.

To finance the stock purchase, the Farm Credit System lends the farmer more money. Thus a farmer must borrow enough money to cover both the needs of the business and the required stock purchases. The stock purchase is typically handled automatically. The borrower may be unaware of the stock purchase.

The stock purchase represents an added cost of the loan and therefore influences the effective cost of the credit to the farmer. Since the interest rates quoted to farmers by the Farm Credit System normally do not include the cost of this stock requirement, they understate the actual interest rate and can lead farmers to make inaccurate comparisons in assessing alternative credit sources. It also results in publication of noncomparable interest rate series at the

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[1]The thirteen banks for cooperatives also have a stock requirement that serves the same function. This article, however, relates solely to farm-level lending.

national level. Since these interest rate series are used to indicate relative farm-level interest costs and industry competitiveness in agricultural credit policy decision making, this understatement could lead to inaccurate policy recommendations.

This article explains the basic stock requirement plans used by the Farm Credit System and then discusses the particular characteristics of plans used by individual associations. The effects of the stock requirement on annual equivalent interest rates are then presented. Finally, farm and national level uses of annual equivalent rates adjusted for stock costs are discussed.

Stock Plan Characteristics

Stock plans have two basic characteristics that determine the effect of the stock requirement on the interest rate that is effectively paid on loans. Those characteristics are (1) the stock requirement percentage, and (2) the stock cancellation plan.

Stock Requirement Percentage

The stock requirement percentage indicates the amount of stock that a farmer must buy as a percentage of the total amount of money borrowed. For example, if the stock requirement percentage was 10 percent and a farmer needed $90,000 for his business, he would be required to borrow $100,000 and buy $10,000 worth of stock.[2]

The stock requirement percentage is currently applied to the gross loan (loan proceeds plus stock) in all cases. Historically, some associations applied the percentage to the amount of the loan proceeds in order to avoid requiring stock on that portion of the loan used to purchase stock (referred to as charging "stock on stock"). The Farm Credit Administration now requires that the percentage be applied to the gross amount of the loan.

[2]Theoretically, the farmer could buy the stock with equity funds and borrow only the added funds needed. But use of equity funds to buy stock would increase the amount of added funds to be borrowed by the amount of equity capital used to buy stock. Thus the amount borrowed and the amount of funds available to the business as a result of that borrowing are the same regardless of whether equity capital or borrowed funds are used to buy stock.

Stock Cancellation Plans

Most PCAs and FLBs use one of two stock cancellation plans: either the automatic or the end-of-period plan. Under the automatic cancellation plan the farmer pays interest on both stock and loan but never makes principal payments on the stock. As the principal on the loan is paid off, the associated stock is automatically reduced (canceled) to the minimum amount required, and the loan on the stock is reduced correspondingly. With this plan there are effectively two loans, one for the farm investment (proceeds of the loan) on which normal interest and principal payments are made and one for the stock on which only interest is paid. The stock loan is always maintained at the stock requirement percentage of the principal outstanding.

Returning to the example, the farmer would make principal and interest payments on $90,000 but would pay only interest on $10,000. As principal payments were made on the $90,000, stock would be canceled and the $10,000 loan reduced so that the outstanding stock (and stock loan) exactly equaled 10 percent of the total balance on the two loans. That is, when the principal was reduced to $45,000 the stock outstanding and the stock loan would have been reduced to $5,000. The $5,000 is 10 percent of the $50,000 balance on the two loans ($45,000 + $5,000).

The end-of-period cancellation plan requires purchase of the same amount of stock at the time the loan is obtained (with a given requirement percentage) as does the automatic cancellation plan, but the loan on that stock remains a part of, and is handled in the same way as, the loan obtained for farm investment. The principal and interest payments are made on both the investment loan and the stock loan. At the time that loan is paid off, the investment in the stock is refunded, or, more frequently, is used to make the final payment on the loan.

For the example situation, $10,000 worth of stock would be purchased, the complete $100,000 would be amortized over the loan period, and the farmer would make principal payments of $10,000 on the stock over the period of the loan. At the end of the loan period the $10,000 stock investment would be refunded. At the farmer's option, pay-

ments on the loan could be stopped as soon as the loan had been paid down to the point that the stock to be refunded would be sufficient to make the remaining payment.

Stock Plans Employed by the Farm Credit System

The Farm Credit System is made up of a large number of cooperative associations, each with considerable independence. Therefore, it is not surprising that the specific characteristics of the plans in use throughout the United States vary considerably.[3]

Federal Land Banks

Since federal land bank loans are by law made at the district level with the local FLBAs serving as agent for the district bank, there is one FLB stock plan for each district. The same basic plan is used in many districts. The most widely used plan, which is used in nine of the twelve districts (all except Baltimore, Sacramento, and Omaha), has a stock requirement of 5 percent with end-of-period cancellation. There is no automatic retirement of stock. A borrower can make a special request to retire excess stock, but this is usually granted only in hardship situations. Stock is used to make the final loan payment.

The Baltimore district has a requirement of 5 percent with automatic annual cancellation down to 6 percent. Farmers make principal and interest payments on the complete loan, including the stock. Once each year the excess stock on all loans is retired to the 6 percent level.

The Sacramento district has a requirement of 6 percent with annual automatic cancellation of stock. The borrower pays principal and interest on the entire loan, including the stock. Excess stock is canceled annually and is used to reduce the principal outstanding on the loan. The level of monthly or annual payments is not influenced by the retirement of stock.

The Omaha district has a 5 percent stock requirement with annual automatic cancellation down to 8 percent. Stock cancellation is used to reduce the principal outstanding but does not affect the amount of each payment made by the farmer. Thus the loan is repaid in fewer years than the originally agreed term. This district plans to reduce the 8 percent maximum stock level to 6 percent in the next few years.

Production Credit Associations

The stock requirement percentage on PCA loans ranges from 5 to 10 percent. The 198 associations for which data were obtained varied considerably in the requirement percentages used (table 1).[4]

Table 1. Distribution of Stock Requirement Percentages 198 Production Credit Associations[a]

Stock Requirement Percentage[b]	Associations	
	Number	Percent[c]
5	56	28
7	10	5
7.41	1	1
7.50	8	4
8	23	12
9	1	1
9.09	5	3
10	94	47

[a]From FICBs in Baltimore, Columbia, Louisville, Sacramento, Springfield, St. Louis, and Wichita.

[b]Percent of gross loan.

[c]Totals do not add because of rounding.

Approximately 40 percent of the associations used end-of-period cancellation; 31 percent used automatic cancellation, normally at the time each loan payment is made. In some cases cancellation occurs quarterly. Regardless of the timing, many associations impose a minimum retirement amount, ranging from $2 to $500. Although retirement occurs automatically, it occurs only when the excess stock exceeds the minimum stated amount. Imposition of such a minimum is apparently designed to reduce the accounting burden and generally would have only a minimal effect on the annual equivalent interest rate.

[3]The information for this section was obtained via mail questionnaire to all FLB and FICB treasurers in the fall of 1981 and personal correspondence with district and association personnel.

[4]This section is based on data supplied by federal intermediate credit banks in Baltimore, Columbia, Louisville, Sacramento, Springfield, St. Louis, and Wichita.

Another 20 percent use one of a variety of modified automatic cancellation plans. A few have automatic cancellation down to a percentage that is higher (say, 10 percent) than the original stock requirement percentage (say, 5 percent). More frequently, stock is automatically retired whenever total payments on a loan since the last cancellation exceed a prespecified amount, such as $5,000. This method can reduce the bookwork involved when automatic cancellation is not computerized. Other associations will cancel excess stock upon the farmer's request. For many farmers this is much like end-of-period cancellation because they seldom request cancellation.

In some associations the stock on annual production loans is never retired but is held to meet the stock requirement on future advances on a line of credit or for production loans required in the following year. This practice reduces the new amount that the farmer must borrow whenever credit is needed and allows the loan proceeds to equal the amount of money borrowed on many loans, but the farmer may own far more stock than is necessary for significant portions of the year.

Annual Equivalent Interest Rates

The influence of the stock requirement on the actual interest rate a farmer pays is different for the two stock cancellation plans. With automatic cancellation the annual equivalent interest rate can be calculated very simply by dividing the stated or contractual interest rate (CR) by the number that results when the stock requirement percentage expressed in decimal form (SR) is subtracted from one. For example, if the stated contract rate is 14 percent and the stock requirement is 10 percent, the annual equivalent interest rate (AER)[5] is:

$$(1)\quad \frac{CR}{1-SR} = \frac{14}{1-.10} = \frac{14}{.9} = 15.56 \text{ percent}$$

[5]Annual equivalent interest rate is used to represent the actual annual interest rate paid. It is equal to the true rate multiplied by the number of payments made per year and is equal to the nominal rate as used in many textbooks (Lee et al.). The term nominal is not used here, however, in order to avoid confusion because historically nominal has been widely misused.

In this case the stock requirement increases the annual equivalent interest rate paid by 1.56 percentage points. Over the range of likely interest rates and stock requirement percentage combinations the stock increases the annual equivalent interest rate by one-half to almost two percentage points (table 2). The absolute effect of the stock requirement is greater at high than at low interest rates.

Table 2. Farm Credit System Annual Equivalent Interest Rates Automatic Cancellation of Stock

Contractual Interest Rate (%)	Stock Requirement (%)		
	5	8	10
	Annual Equivalent Interest Rate		
8	8.42	8.70	8.89
9	9.47	9.78	10.00
10	10.53	10.87	11.11
11	11.58	11.96	12.22
12	12.63	13.04	13.33
13	13.68	14.13	14.44
14	14.74	15.22	15.56
15	15.79	16.30	16.67
16	16.84	17.39	17.78
17	17.90	18.48	18.89

The influence of the end-of-period cancellation plan on annual equivalent interest rates is much more difficult to determine. The farm cost of stock ownership in this case takes two forms. First, as with the automatic cancellation plan, interest is paid on the stock loan. This is a cost because it represents payment of interest on funds that were not received and were not usable. Second, as principal is paid on the stock investment the farm business is investing its own funds in the stock. It receives no return on this investment, but if the funds could be productively invested in the business they would be earning a return. At a minimum the funds could be used to pay off the debt and the interest cost could be avoided. For a given stock requirement percentage, the end-of-period cancellation plan costs more than the automatic cancellation plan because the amount of stock is not reduced as the loan is repaid. For the example situation, the entire $10,000 would be invested in stock for the life of the loan.

Calculation of the AER for the end-of-period cancellation plan requires use of an iterative mathematical procedure that can be done

Table 3. Farm Credit System Annual Equivalent Interest Rates
End-of-Period Cancellation of Stock
5 Percent Stock Requirement, Annual Payments

Contractual Interest Rate (%)	Repayment Period (years)							
	1	3	5	7	15	20	25	30
	Annual Equivalent Interest Rate (%)							
8	8.42	8.62	8.65	8.66	8.60	8.56	8.53	8.50
9	9.47	9.69	9.73	9.73	9.65	9.61	9.58	9.55
10	10.53	10.76	10.80	10.79	10.71	10.66	10.62	10.59
11	11.58	11.83	11.87	11.86	11.76	11.71	11.67	11.64
12	12.63	12.90	12.94	12.92	12.81	12.75	12.71	12.69
13	13.68	13.97	14.00	13.99	13.86	13.80	13.76	13.73
14	14.74	15.04	15.07	15.05	14.91	14.85	14.81	14.78
15	15.79	16.11	16.14	16.11	15.96	15.89	15.85	15.83
16	18.84	17.17	17.20	17.17	17.00	16.94	16.90	16.87
17	17.90	18.56	18.26	18.23	18.05	17.99	17.94	17.92

on a computer. Estimates using standard equations or tables are at best rough approximations and are frequently inaccurate.[6] Annual equivalent interest rates were calculated with such a computer routine (LaDue). The routine iteratively searches for the rate of discount that will make the discounted value of all payments equal to the original principal balance. Annual equivalent rates generated for the most frequently used stock requirement percentages, typical repayment periods, and several interest rates are shown in tables 3 through 6. These rates are calculated under the assumption that the FLB or PCA is charging interest on the unpaid balance and that the total of principal plus interest paid each year or month is constant throughout the life of the loan (level payment plans). The calculations are not accurate for loans in which each principal payment is constant and the interest payment declines as the loan is repaid (declining payment plans).

As the term of an annual payment loan is increased from one year, the effect of the stock on the AER first increases and then decreases. This pattern is a direct consequence of the average level of outstanding principal, which results from use of a level repayment plan. The average level of outstanding principal over the life of the loan rises as the term increases to five or seven years and falls as the term increases beyond that point. With a constant stock requirement, the ratio stock to average outstanding principal, and thus the effect of the stock on the AER, varies inversely with the average outstanding balance. The same pattern is exhibited by monthly payment loans with a 10 percent stock requirement except that the average balance starts to decline sooner. At the higher interest rates with a 5 percent stock requirement, the effect of the stock declines consistently as the term is increased over the range presented.

The AERs reported here do not include cooperative dividends. In some cases, PCAs and FLBs may pay dividends (Farm Credit Administration). To the extent that cash dividends are received, the data in tables 2 through 7 will overestimate the cost of the stock to the borrower. If dividends are declared but not paid in cash, the borrower has received an ownership interest in the cooperative for which payment will likely be received at some future date. Unless payment is received fairly soon after the dividends are declared, the impact on the AER will be modest.

For annual production loans with only one payment the automatic cancellation and end-of-period cancellation are effectively the same. Because there is only one payment, no principal payments are made on the stock; it is retired when the final, and only, payment is made. For these situations, equation (1) and table 2 can be used to determine the annual equivalent interest rate.

[6]The reader can verify this point by estimating AERs using equations and tables found in Board of Governors of the Federal Reserve System or Lee et al.

Table 4. Farm Credit System Annual Equivalent Interest Rates
End-of-Period Cancellation of Stock
5 Percent Stock Requirement, Monthly Payments

Contractual Interest Rate (%)	Repayment Period (years)							
	1	3	5	7	15	20	25	30
	Annual Equivalent Interest Rate (%)							
8	8.79	8.80	8.77	8.73	8.62	8.56	8.53	8.51
9	9.89	9.88	9.84	9.80	9.67	9.62	9.57	9.55
10	10.98	10.98	10.93	10.87	10.73	10.66	10.63	10.60
11	12.08	12.06	11.99	11.93	11.78	11.71	11.67	11.63
12	13.17	13.13	13.06	13.00	12.82	12.75	12.71	12.69
13	14.26	14.22	14.14	14.06	13.87	13.81	13.76	13.73
14	15.36	15.31	15.22	15.13	14.92	14.85	14.80	14.78
15	16.45	16.40	16.28	16.20	15.97	15.89	15.85	15.81
16	17.54	17.47	17.35	17.25	17.01	16.93	16.87	16.87
17	18.63	18.54	18.41	18.32	18.05	17.98	17.94	17.92

Table 5. Farm Credit System Annual Equivalent Interest Rates
End-of-Period Cancellation of Stock
10 Percent Stock Requirement, Annual Payments

Contractual Interest Rate (%)	Repayment Period (years)							
	1	3	5	7	15	20	25	30
	Annual Equivalent Interest Rate (%)							
8	8.89	9.33	9.42	9.42	9.28	9.19	9.12	9.06
9	10.00	10.48	10.57	10.57	10.40	10.30	10.22	10.16
10	11.11	11.64	11.73	11.71	11.51	11.40	11.32	11.26
11	12.22	12.79	12.87	12.85	12.62	12.50	12.41	12.35
12	13.33	13.94	14.02	13.99	13.72	13.60	13.51	13.45
13	14.44	15.09	15.16	15.12	14.82	14.69	14.60	14.54
14	15.56	16.23	16.31	16.25	15.93	15.79	15.70	15.64
15	16.67	17.38	17.44	17.38	17.03	16.88	16.80	16.74
16	17.78	18.52	18.58	18.50	18.13	17.98	17.89	17.84
17	18.89	19.66	19.71	19.62	19.22	19.08	18.99	18.94

Table 6. Farm Credit System Annual Equivalent Interest Rates
End-of-Period Cancellation of Stock
10 Percent Stock Requirement, Monthly Payments

Contractual Interest Rate (%)	Repayment Period (years)							
	1	3	5	7	15	20	25	30
	Annual Equivalent Interest Rate (%)							
8	9.61	9.76	9.67	9.59	9.33	9.20	9.13	9.07
9	10.81	10.94	10.84	10.74	10.43	10.31	10.22	10.16
10	12.00	12.14	12.01	11.88	11.55	11.41	11.32	11.26
11	13.19	13.32	13.16	13.02	12.65	12.50	12.41	12.34
12	14.38	14.49	14.32	14.16	13.74	13.60	13.50	13.44
13	15.57	15.67	15.47	15.30	14.84	14.70	14.60	14.53
14	16.76	16.86	16.63	16.43	15.94	15.79	15.69	15.63
15	17.95	18.04	17.77	17.56	17.04	16.88	16.79	16.72
16	19.14	19.21	18.92	18.68	18.13	17.97	17.88	17.83
17	20.32	20.36	20.05	19.81	19.22	19.07	18.98	18.94

Table 7. Annual Equivalent Interest Rate on Production Loans When Stock Is Not Retired[a]

Contractual Interest Rate (%)	Duration of Loan (months)[b]		
	6	8	10
	Annual Equivalent Interest Rate (%)		
	10% Stock Requirement		
8	9.89	9.36	9.07
10	12.33	11.69	11.34
12	14.76	14.02	13.60
14	17.19	16.34	15.86
16	19.60	18.65	18.12
18	22.00	20.96	20.38
20	24.40	23.27	22.63
	5% Stock Requirement		
8	8.85	8.63	8.50
10	11.05	10.78	10.63
12	13.25	12.93	12.75
14	15.44	15.08	14.87
16	17.63	17.23	16.99
18	19.82	19.37	19.12
20	22.00	21.52	21.24

[a]Stock held for complete 12-month period. Annual rather than monthly compounding and discounting was used.

[b]Number of months during the year for which funds were borrowed. Complete loan amount outstanding for the duration of the loan with one payment of principal and interest at the end of the loan period.

When production loans are repaid in less than one year but the stock is held by the association and used to meet the stock requirement for the following year's loan, the annual equivalent interest rate is higher than that obtained using equation (1). The farmer does not have use of the funds invested in the stock for the whole year. The longer the period between repayment of one year's loan and procurement of the next year's loan, the greater the effect of the stock requirement on the annual equivalent interest rate (table 7).

Farm Level Use of Annual Equivalent Rates

The annual equivalent interest rates, shown in tables 2 through 7, should be compared with rates offered by other sources of funds that require no stock purchase. If there are other credit charges or mandated fees, such as appraisal fees, points, compensating balances, loan application fees, or required insurance connected with either loan, additional adjustments will have to be made to reflect these costs. If there are no such additional charges with either loan, the annual equivalent rate (AER) is comparable to the annual percentage rate (APR) that some lenders may provide when the APR is calculated using the discounted cash flow or equivalent method. The AER for loans from associations that use a modified automatic stock cancellation plan will be between the end-of-period rate and the automatic cancellation rate. Estimation of the exact point on that interval that the AER falls will be based on the characteristics of the plan. The closer it is to an automatic cancellation plan, the closer the actual rate is to the automatic cancellation rate.

Interest rate is only one of the factors people consider in deciding where to borrow funds. Some of the other factors, such as the amount of business and financial assistance received or the desire to support a cooperative that ensures the existence of a competitive source of farm loans, cannot be financially quantified. When nonquantifiable factors are involved, use of annual equivalent rates that incorporate the cost of the stock requirement assists in the analysis by quantifying one variable that was formerly unquantified, namely, the cost of stock requirement.

Farm Credit interest rates are frequently used as a basis for setting rates on personal loan transactions in the agricultural community. They relate primarily to agricultural operations, are easily identifiable, their volume is large enough to result in a stable rate, and the data are readily accessible. Examples include seller financing of the purchase of farm land and family loans made as part of partnership arrangements. Frequently it is the intent of these arrangements that the borrower shall pay the same rate as would be paid to the local FLB or PCA. In such situations the intent would be achieved only if the interest rate charged is the annual equivalent interest rate as shown in tables 2 through 6. If, as frequently happens, the rate used is the PCA or FLB contract rate, the borrower is getting the funds for a lower rate than would be paid to the FLB or PCA.

Assume, for example, that a former owner takes back a 20-year mortgage on a farm

and agrees to interest at the current rate charged by the local FLB. If he asks the local FLB for its current rate, he will be given the contractual rate. Assume that this rate is 12 percent. If the buyer pays 12 percent interest on the loan, he will be paying less than the annual equivalent rate of 12.75 percent that would be paid to the FLB for the same loan (assuming the FLB has a 5 percent stock requirement and an end-of-period cancellation stock plan, table 3). Or, from a different view, the former owner is receiving .75 percent lower interest than would be charged by the local FLB or PCA.

National Level Use of Annual Equivalent Rates

The interest rates reported by the system itself (Nevin and Guebert), the U.S. Department of Agriculture (U.S. Department of Agriculture), and other official publications (Melichar and Balides) are contract rates and thus exclude the cost of required stock. Of course, the interest rates reported for commercial banks, insurance companies, and other lenders also exclude all loan fees. In addition, all of these lenders, including the Farm Credit System, may charge points and other fees in certain geographical locations, at selected times, and within some economic environments. The Farm Credit System stock requirement is unique in at least two ways, however: (1) it is applied to all loans made by the system, and (2) the Farm Credit System is the only major agricultural lender to impose the requirement. Because of the stock requirement, reported rates on Farm Credit System loans are biased downward relative to other rates. To compare its rates directly with other reported rates, as is frequently done (U.S. Department of Agriculture), can be misleading.

Calculating annual equivalent interest rates corresponding to the reported regional or national contract rates presents some problems. Considerable complexity is introduced by the wide variability in stock plans used by the various associations and the aggregation difficulties that variation implies. Calculating average rates for only a single association or a district composed of associations with relatively uniform requirements can even present obstacles.

The major problems occur in associations with end-of-period cancellation. First, the loan term influences the annual equivalent rate. The average outstanding loan term is available for FLB loans (Nevin and Guebert) but is not published on a regular basis for PCAs. Use of the average could introduce some bias if the distribution of terms around the mean was not uniform, but this effect would likely be minor.

Second, the effect of the stock is influenced by loan refinancing. If a loan is frequently refinanced, and the stock amount is realigned to the outstanding principal each time, the average amount of stock outstanding relative to the average principal outstanding will be lower because the amount of stock relative to the remaining principal balance is lowest at the time the loan is obtained. Refinancing returns the stock to that low level and delays the increase in stock relative to principal that occurs as the loan is paid off. This problem could be handled either by indicating that the calculated annual equivalent rate assumes all loans were held to maturity or by incorporating the average actual outstanding term of loans into the calculation procedure (which would require data not currently published).

Another problem for end-of-period cancellation of short- and intermediate-term loans is that the annual equivalent rates with monthly and annual payments differ significantly. This is primarily a problem with PCA rates because the difference is small for long-term rates (see tables 2 through 6).

Three problems exist in calculating rates for associations with automatic cancellation. All result from employing slight modifications of the automatic cancellation process. First, some associations only cancel stock that exceeds a minimum balance amount, which can result in slightly higher than necessary levels of stock at some times. As long as the minimum cancellation amount is modest relative to the loan, however, this procedure should have little impact on annual equivalent rates. Since most minimums are below $100, there should be little effect on rates.

Second, cancellation is sometimes conducted less frequently than payments are made. For example, all FLBs with automatic cancellation currently cancel annually even

though some loans are amortized on a monthly basis, which results in a higher than required level of stock before each cancellation date. This effect on annual equivalent rates would also be small for most loans, particularly long-term loans.

The third problem occurs when the stock is canceled down to a level different from the original percentage purchased. For example, one FLB has a 5 percent stock requirement but automatically cancels down to 6 percent. This procedure represents a combination of automatic and end-of-period cancellation; exact calculation of the annual equivalent rate requires numerous hand calculations or development of a computer routine to determine the amount and timing of stock cancellation.

To develop interest rate series for the Farm Credit System that are comparable to rates reported by other lenders, two alternatives exist. One is to apply an average stock requirement to the average reported contract rate and use the result as an approximation of the annual equivalent rate. Since nine of the twelve FLBs use the same stock plan and the other three employ only slight modifications of that standard plan, use of this alternative should be accurate.

Because of the wide variety of stock plans employed, use of this alternative for PCAs could be more difficult and somewhat less accurate. Use of the average term to estimate an approximate annual equivalent rate would allow for more accurate interest rate comparison than is currently typically done.

The second alternative is for the Farm Credit Administration (FCA) or the USDA, with cooperation from the FCA, to develop a computer routine that incorporates the characteristics of the various stock plans in use and calculates the annual equivalent rates from the reported contract rates and other loan characteristics. This procedure would be most accurate and most efficient in national resource use.

To illustrate application of the first alternative, the rates reported for the federal land banks (Farm Credit Administration) were used to calculate annual equivalent rates covering the period 1977 through the second quarter of 1983 (table 8). These calculations were made using (1) a 5 percent stock requirement with end-of-period cancellation, (2) a 27-year loan term (the weighted average term for new FLB loans made over the period) (Nevin and Guebert), (3) annual payments, and (4) loans held to maturity. Since the data reported in the *Agricultural Finance Databook* are unweighted means of the rates reported by individual districts, a

Table 8. Contract and Annual Equivalent FLB Interest Rates and Commercial Bank Long-Term Real Estate Rates, 1977–1983

Date		Federal Land Banks		Commercial Bank[c]
		Contract Rate[a]	Annual Equivalent Rate (approx.)[b]	
		percent		
1977	Q1	8.5	9.0	9.2
	Q2	8.4	8.9	9.2
	Q3	8.3	8.8	9.2
	Q4	8.3	8.8	9.2
1978	Q1	8.2	8.7	9.3
	Q2	8.3	8.8	9.3
	Q3	8.3	8.8	9.5
	Q4	8.4	8.9	9.7
1979	Q1	8.7	9.3	10.1
	Q2	9.0	9.6	10.4
	Q3	9.3	9.9	10.7
	Q4	9.3	9.9	11.6
1980	Q1	9.8	10.4	12.6
	Q2	10.6	11.2	15.4
	Q3	10.6	11.2	13.4
	Q4	10.3	10.9	13.5
1981	Q1	10.6	11.2	16.0
	Q2	10.9	11.6	15.7
	Q3	11.4	12.1	17.1
	Q4	11.7	12.4	18.0
1982	Q1	12.1	12.8	16.9
	Q2	12.2	12.9	17.0
	Q3	12.4	13.1	17.0
	Q4	12.4	13.1	15.9
1983	Q1	11.9	12.6	14.6
	Q2	11.8	12.5	N.A.

[a]Unweighted average quoted rates, first day of quarter from E. Melichar and P. Balides, *Agricultural Finance Databook*, Board of Governors of the Federal Reserve System, April 1983, p. 32.

[b]Five percent stock requirement with end-of-period cancellation, 27-year term, and annual payments, calculated from the average contract rate.

[c]Average of rates reported for long-term real estate loans made by commercial banks in the fifth (Richmond), seventh (Chicago), ninth (Minneapolis), tenth (Kansas City), and eleventh (Dallas) Federal Reserve Districts. Source: *Agricultural Finance Databook*, Quarterly Series; Board of Governors of the Federal Reserve System.

slightly more accurate procedure would have involved using the rate for the individual districts and then averaging. These quarterly data were not available, however. Given the narrow range usually found for rates in different districts, using the average rate as reported would likely have only a modest effect on the average equivalent rate, almost certainly less than that imposed by the level of rounding used.

To determine the error introduced by using the predominant stock plan term to indicate stock cost, the annual equivalent rate was calculated for the lowest (8.2 percent) and highest (12.4 percent) interest rates reported over the period, using the actual stock plans in effect for each district. The national AER was then calculated by weighting the results by the volume of FLB new loans during the year in which the interest rate was in effect (Nevin and Guebert). The AER calculated in this manner was within one-one-hundredth of one percentage point of the rate calculated using a 5 percent stock requirement and end-of-period cancellation for the entire loan portfolio as presented in table 8. Given the level of rounding used, the AERs presented appear accurately to reflect the effect of the stock over this period. As long as only a few districts use a stock plan other than the standard 5 percent end-of-period cancellation and the deviations of those who do make changes are small, rates calculated using this approximation procedure are apparently fairly accurate.

The annual equivalent FLB rates were .5 to .7 percentage points above the reported contract rate. Adjusted FLB rates were roughly comparable to bank rates during part of the 1977–83 period, although the stock requirement represented only a small part of the difference between FLB and bank rates during much of the period. The FLB has been able to offer very competitive rates during the entire period, particularly from 1980 to 1982. Although adjusting the FLB rates for the stock requirement presents a more accurate representation of the rates charged, it does not result in a shift in the relative position of long-term rates charged by lenders.

Since reported PCA rates have generally been significantly higher than FLB rates during the last few years and PCA stock requirements are frequently higher than FLB requirements (Melichar and Balides), the difference between the contract and annual equivalent rate for PCAs likely would be considerably greater than that found for FLBs. Information on the stock requirement plans used in all associations would be required to develop an estimated annual equivalent rate for PCAs that would be sufficiently accurate for publication.

Summary and Conclusions

To provide capitalization for the Farm Credit System each borrower purchases stock in proportion to the amount of money borrowed. Payment for this stock is routinely done by increasing the amount of money borrowed. Interest, and in some cases principal, payments are made on stock. Since the extra money borrowed to buy stock cannot be used in the borrower's business, the interest paid on the stock amounts to an added cost of the funds actually received. This stock requirement increases the annual equivalent interest rate by one-half to two percentage points depending upon the level of the stock requirement, the interest rate, whether automatic or end-of-period cancellation is used, the term of the loan, and other minor factors.

The stock requirement should be accounted for in comparing interest rates at both the farm and the national levels. At the farm level the tables presented can be used to estimate the annual equivalent interest rate from the given contract rate. This rate can then be compared with other rates for borrowing money or used as a standard agricultural rate for seller or intrafamily financing.

At the national level FLB and PCA rates should be adjusted for the stock requirement before comparing them to rates offered by other lenders. The FCA and USDA could facilitate national policy formation and analysis by publishing an adjusted interest rate series that reflects the stock requirement.

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